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THE IMPACT OF SPS MEASURES ON AGRICULTURAL EXPORTS FROM DEVELOPING COUNTRIES: A Case Study of Indonesian Fishery Industry

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ABSTRACT

The proliferation of Sanitary and Phytosanitary measures for food products responds to risk exposure. Growing food consumption and an ever-widening food supply network increase food-safety risks. Current measures to mitigate these risks have evolved from an end-product approach to a process-based approach that focuses on preventative mechanisms and the traceability to achieve zero food risk. A notable example of the new approach is the HACCP requirement.

Researchers in this field seem to agree that the huge cost of developing HACCP system will pay for itself after some period of adjustment. The system prevents post-processing loss and acts as a catalyst to improve the food safety assurance system in the exporting country. However, the distributional effects of HACCP to small-scale operators in developing countries are detrimental. A similar situation has happened in the Indonesian fish industry where small-scale operators, particularly those in the upstream stage, are unable to participate in the new system. The government should be informed of this effect to implement focused strategies that enable and encourage small-scale operators to participate in the HACCP system.

DECLARATION

This master thesis has been written in partial fulfilment of the Master of International Law and Economics Program at the World Trade Institute. The ideas and opinions expressed in this paper are made independently, represent my own views and are based on my own research. I confirm that this work is my own and has not been submitted for academic credit in any other subject or course. I have acknowledged all material and sources used in this paper. I understand that my thesis may be made available in the World Trade Institute library.

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LIST OF ABBREVIATIONS

BPS	Indonesian Statistics/ Badan Pusat Statistik
CCP	Critical Control Points
EU	The European Union
DG-A	Directorate General of Agriculture
DG-CF	Director General of Caught Fisheries
DGFPPM	Directorate General of Fisheries Products Processing and Marketing
DG-SANCO	Directorate General for Health and Consumers
FAO	Food and Agriculture Organization of the United Nations
FQIA	Fish Quarantine and Inspection Agency
GDP	Gross Domestic Product
GMP	Good Manufacturing Practice
HACCP	Hazard Analysis and Critical Control Points
IDR	Indonesia Rupiah
IICB	Indonesia Investment Coordinating Board
MMAF	Ministry of Marine Affairs and Fisheries
NASA	National Aeronautics and Space Administration
PAF	Prevention, Appraisal and Failure Model
RASFF	Rapid Alert System for Food and Feed
SKP	Certificate for Processing Eligibility/ Sertifikat Kelayakan Pengolahan
SME	Small and Medium Sized Enterprises
SPS	Sanitary and Phytosanitary
SPSA	The Sanitary and Phytosanitary Agreement
SSOP	Sanitation Standard Operating Procedure
STDF	Standards and Trade Development Facility
US	The United States
WHO	World Health Organization
WTO	World Trade Organization

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1. INTRODUCTION

Fisheries products have always been the main source of trade surplus for developing countries vis-à-vis the developed countries with the major export destination being European Union (EU), Japan and United States (US).[1] These countries dominate in market price as well as standards requirements. The imposition of Sanitary and Phytosanitary (SPS) measures in the form of food safety requirements limits access into developed countries' markets for seafood products, particularly for developing countries exporters. However, exporters are left with no choice but to fulfill them to access the destined market. Evidence of the impact of the SPS measures can be found by looking into Indonesian fish industry. Indonesia was ranked second in global fish capture productions and fourth in aquaculture productions while only eleventh in terms of its fishery products exports in 2012.[2] This paper explains how the food safety measures have hampered Indonesia's fish exports by focusing on the *Hazard Analysis and Critical Control Points* (HACCP) requirements as implemented by the EU.

Fishery products are one of the most traded food products; the world market for processed fishery products intended for human consumption is growing rapidly. The trade in fishery products is likely to accelerate aligns with the increasing demand for seafood. However, export activities are hampered by the standards requirements that vary from one market to another. Ababouch et al. pointed out that the standard requirements are the ultimate challenge for fishery products exporters. Failure to meet these standards has resulted in border detentions which have brought more than revenue loss. Exporters often suffered from far reaching impacts such as loss of market share and clients, negative image for the products, decreased demand and price, loss of momentum and stricter physical check for future shipment.[3]

Fish is the commodity with the greatest trade surplus for developing countries, accounting for almost $10 billion in 1989, more than $15 billion in 1999 and around $25 billion in 2009.[4] The European Union is by far the largest single market for fishery products, followed by Japan and US.[5] EU's fish imports reached $44.6 billion in 2010, 10% higher than the 2009 level and

[1] FAO, *Fishery and Aquaculture Statistics 2012*, Rome, 2014.
[2] *Ibid.*
[3] Ababouch, L., Ross, T. & Sumner, J., 'Application of Risk Assessment in the Fish Industry', *FAO Fisheries Technical Paper* No. 442, Rome, FAO, 2004.
[4] FAO Fisheries and Aquaculture Department, The State of World Fisheries and Aquaculture 2012, FAO, Rome, 2012, p.72.
[5] FAO, See note 1, p. 44.

representing 40% of world imports.[6] Seventy-five percent of global fish exports are destined for these three importers that happen to have the strictest standards requirements. The demand for food safety and quality standards in the EU is mainly driven by fish processors and leading supermarket chains and has continued to increase over time.[7] Indeed, the EU has less border detention cases compared to Japan and US given that it uses a more prevention-based approach. This approach prevents post-processing loss; however, it penalizes seafood companies in countries that do not have sufficient capacity to establish a well-functioning competent authority and risk management system.[8]

The characteristic of the fish trade has shifted to a *buyers' market* where the sellers are in tight price competition and the buyers are more knowledgeable of the quality and hygiene level of the foods and the process involved. The risks of contamination from bacteria, viruses, toxins and chemicals that can cause fish-borne illness are high throughout the seafood production chain.[9] These risks however are not apparent in the end products themselves creating the lack of incentive for firms to ensure seafood safety throughout the production chain. This has left the governments of importing countries with no choice but to adopt a variety of preventive measures to ensure the safety of the imported fish products. Indeed, international organizations, e.g. the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) have always supported preventive measures to control food hazards along the entire food chain rather than end-products inspection.[10]

In addressing the ever-increasing risk of fish-borne illness or any food-related hazards for that matter, governments around the world have adopted various Sanitary and Phytosanitary (SPS) Measures for imports. At the multilateral level, the utilization of SPS measures in international trade is regulated by *the WTO Agreement on the Application of SPS Measures* (SPS Agreement or SPSA). According to the SPSA, SPS measures are any measure applied to protect animal, plant and human life and health and to prevent other damage within the territory of a

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[6] FAO Fisheries and Aquaculture Department, See note 4. P. 72.
[7] Frohberg, K., Grote, U. & Winter, E., 'EU Food Safety Standards, Traceability and Other Regulations: A Growing Trade Barrier to Developing Countries' Exports?', *Paper Presented at the International Association of Agricultural Economics Conference, Gold Coast, Australia*, August 2006, p. 7. retrieved 16/10/2014, http://purl.umn.edu/25668
[8] Ababouch, See note 3, p.60.
[9] Jensen, H., Changes in seafood consumer preference patterns and associated changes in risk exposure, p 596-597
[10] Burlingame, B. & Pineiro, M., 'The essential balance: Risks and benefits in food safety and quality', *Journal of Food Composition and Analysis*, Volume (20), 2007, p. 142, retrieved 8/10/2014, accessible through www.elsevier/locate/jfca

Member.[11] The agreement's intent is to liberalize agricultural trade by obligating the WTO Members to base their SPS measures on scientific principles and sufficient scientific evidence.[12] It also encourages Members to harmonize their SPS measures in line with those of international standards, guidelines and recommendations. The international standards, guidelines and recommendations refer specifically to the products of three organizations, i.e. Codex Alimentarius Commission (Codex), the International Office of Epizootics and the International Plant Protection Convention.[13] These three organizations are known as politically neutral scientific bodies that provide non-legally binding advice and decisions regarding SPS measures.[14] Codex deals specifically with issues concerning food safety.

From an economic standpoint, any SPS measure is burdensome for exporters due to the restrictive nature of standards requirements. The efficiency of food safety measures is questionable[15] even when the measure itself is in accordance with the SPSA. In order to seize the market opportunity, exporters must be able to meet these standards while continuously supplying the products at a competitive price.[16] Sometimes, this means changing the whole chain of their production method. The changes are burdensome for the fishery industry since the industry is operated through a long value chain that involves complex types of operators, infrastructures and technologies.[17] The burden is made worse in the case of requirements that are more stringent than the established international standards. These type of SPS measures may be imposed by the WTO Members under the auspices of SPSA given that the level of 'sufficiency' and 'appropriateness' as under the meaning of Article 2.2 and 5.1 of the SPSA, are open for the Panel and Appellate Body to interpret.[18]

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[11] WTO, *the WTO Agreement on the Application of SPS Measures*, Annex A.1.
[12] *Ibid*, Article 3.
[13] *Ibid*, Annex A.2.
[14] Stewart, T. & Johanson, D., 'The SPS Agreement of the World Trade Organization and International Organizations: The Roles of the Codex Alimentarius Commission, the International Plant Protection Convention and the International Office of Epizootics', *Syracuse Journal of International Law and Commerce* (Volume 26), 1998-1999, p. 28, retrieved 27/10/2014, www.heinonline.org
[15] Henson, S. & Caswell, J., 'Food Safety Regulation: an overview of contemporary issues', *Food Policy*, Volume (24), 1999, p. 590, retrieved 8/10/2014, accessible through www.elsevier/locate/foodpol
[16] Burnquist, H. et al, 'Sanitary and Phytosanitary Requirements in Agricultural Trade', *Agricultural Trade Liberalization: Policies and Implications for Latin America*, USA: Inter-American Development Bank, 2004, p. 171.
[17] Gopal, N. & Salim, S., 'Sanitary and Phytosanitary Measures: Objectives and Principles of SPS Agreement and Implications for Indian Fisheries Sector', in Salim, S. & Narayanakumar, R. (eds.), Manual on the World Trade Agreements and Indian Fisheries Paradigm: A Policy Outlook, Cochin, 2012, p. 229.
[18] Das, K. Coping with SPS Challenges in India: WTO and Beyond, *Journal of International Economic Law*, Volume (11/ 4), November 2008, pp. 971-1019, November 2008

The regulatory environment has obliged food business to put more focus on quality and safety control and on traceability of food products.[19] The task is especially daunting for developing countries' exporters. The costs for developing countries' stakeholders to adopt such standards are high due to the overwhelming red tape, lack of managerial capacity and insufficient transport and distribution facility.[20] Not only that the developing countries have low participation in the standards setting process, they also lack the technical capacity and resources to meet the expected standards.[21] They must first gain control over the production and distribution system while operating in cost effective ways to compete in the market.[22] It is also important to note that exporters who find it unprofitable to invest in standards improvement will eventually be wiped off the market. This is particularly true for smaller players who cannot achieve economies of scale.[23]

In this view, the imposition of food safety measures is nothing but a barrier to trade especially for developing countries. In contrast, some have argued that the imposition of standards act as s 'catalyst' for developing countries to improve their export sectors. [24] It also serves to improve the food quality and health standards inside the country itself. Once a developing country is able to comply with the requirements, its competitive advantage and market share will increase. On a more neutral tone, Anders and Caswell have concluded that both arguments do not apply to the developing countries as a whole. It was found, in an aggregate level, that the developing countries as a group suffered significant trade reduction as compared to the group of developed countries. However, the picture was different on country-specific estimations. Some developing countries increased its trade with the US post HACCP while some

[19] Trienekens, J. & Zuurbier, P., ,Quality and safety standards in the food industry, developments and challenges, International Journal of Production Economics, Volume (113/1), May 2008, p. 108., retrieved 8/10/2014, accessible through www.elsevier/locate/ijpe

[20] Nainggolan, K., 'Major Issues and Challenges for Improving the Marketing and Distribution of Agricultural Products', *Agriculture Policy Analysis*, Volume (2/1), Indonesian Agency for Agricultural Research and Development, Ministry of Agriculture, 2004.

[21] Henson, S. & Loader, R., 'Barriers to Agricultural Exports from Developing Countries: The Role of Sanitary and Phytosanitary Requirements', *World Development*, Volume (29/1), 2000, p. 96, retrieved 9/10/2014, accessible through www.elsevier.com/locate/worlddev

[22] Trieneken, *Ibid*, p. 121.

[23] Frohberg, See note 7, p.12.

[24] Anders, S., and Caswell, J., Standards-as-Barriers versus Standards-as-Catalysts: Assessing the Impact of HACCP Implementation on U.S. Seafood Imports, United States Department of Agriculture and Department of Resource Economics – University of Massachusetts Amherst, Working Paper 2007.

others experienced short and long term trade losses. Overall, only well-established exporters benefitted from the 'catalyst effect' of the imposition of standards requirements.[25]

The recent study by Golub and Varma on the impact of food standards requirement on fish exports from several low-income, developing countries found that the food safety standards are indeed costly. Nevertheless, these standards create benefits to fish exporters. This is true in the sense that fulfilling standards ensures better access to market and that the exporters receive better price for selling higher quality products. The standards also induce fish exporters to improve their productivity and efficiency.[26] Two out of five countries observed have shown that standards have acted as 'catalyst' for fish exports after a period of adjustment. Indeed, other studies have shown that the cost to implement and sustain HACCP system is less than the revenue loss suffered from border detentions.[27] A border detention has many trickle-down effects: creates loss of market share and clients; creates a negative image for the products; decreases quantities demanded and price; reduces momentum and induces stricter physical checks for future shipments.[28]

Evidence derived from Indonesia's fish exports to the EU has shown that the imposition of standards does affect the country's performance. The demand for Indonesia's fish is high in the EU's market. One product of importance for the EU is the yellowfin tuna in which imports have grown 38% annually during the last decade. This species inhabits tropical and subtropical seas, with Indonesia having the largest catch in the region.[29] The latest data from the Ministry of Marine Affairs and Fisheries (MMAF) has shown that in 2012, 7% of Indonesia fish exports were directed to the EU market. The volume and value of the exports have decreased by 14.87% and 3.05% compared to last year.[30] For the world's total fish trade in 2009, Indonesia's fish exports accounted for 11% while the EU's fish imports accounted for 25%. Lord, Ruehe and Oktaviani have estimated that if Indonesia's exports were to account for the same proportion as the EU's shares of world's imports, it would have more than doubled the 2009 fishery products exports

[25] *Ibid*, pp. 20 – 22.
[26] Golub, S., Varma, A., 'Fishing Export and Economic Development of Least Developed Countries: Bangladesh, Cambodia, Conoros, Sierra Leone and Uganda', *Paper Prepared for UNCTAD*, Swarthmore College, February 2014, p 19.
[27] Ababouch, See note 3, p. 63.
[28] *Ibid.*
[29]Lord, O., Oktaviani, R. & Ruehe, E., 'Annex A: Fisheries', *Indonesia's Trade Access to the European Union: Opportunities and Challenges*, European Communities (Transtec & Equinoccio), 2010, p. 102.
[30] DGFPPM, MMAF, *Export Statistics of Fisheries Product by Commodity, Province and Port of Export*, 2012, p. viii.

value.[31] In terms of development, the fish industry is a major focus of the Indonesian government's efforts to create more jobs. The industry accounts for more than 5.2 million of the country's employment in both fish capture and aquaculture activities. Approximately 90% of the industry can be classified as small and medium-sized enterprises (SMEs) whose activity is highly labor intensive.[32]

Indonesia's fishery exports to the EU are impeded by sets of food safety regulations. A notable part of the regulations is the HACCP requirements as stipulated in Regulation (EC) 852/2004, 853/2004 and 854/2004. This approach is recommended by the Codex Alimentarius Commission to enhance food safety[33] and is heavily used in fishery products. It is a system that identifies, evaluates and controls hazards, any types of agents or conditions which can cause negative health effects.[34] The system is to be implemented by the establishment of *Critical Control Points* (CCPs) along the food chain based on scientific assessment. At CCPs, set of actions are applied to prevent, eliminate or reduce the hazard. A successful application of HACCP is useful to promote trade by increasing customers' confidence in food safety.[35]

In light of the above, this thesis assesses the enabling environment for Indonesia fish exporters to acquire the most benefit of HACCP. The assessment is more of qualitative nature given that current data on Indonesia's fishery industry is not yet sufficient for a proper quantitative analysis.

The following chapter reviews existing literature on the rationale and the impact of HACCP. The costs and benefits analysis on several case studies of the implementation of HACCP will be the highlight of this chapter. Chapter 3 introduces the EU food safety regime followed by detailed explanations on the HACCP requirements. Chapter 4 describes the Indonesian fishery industry context, including the players involved and the value chain. It also gives description and analysis of current strategies by the Indonesian government and firms in meeting the standards, the cost involved and results of those efforts. Firsthand information from interviews with the MMAF will be presented in this chapter. Several fieldworks on the HACCP implementation on several fish processing plants will also be presented. In Chapter 5, the coping

[31] Lord, *Ibid*, p. 98.
[32] *Ibid.*
[33] Codex Alimentarius Commission, *General Principles of Food Hygiene*, CAC/RCP 1-1969, Rev. 4-2003, p.21.
[34] FAO, Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for Its Application, Annex to CAC/RCP 1-1969, Rev.3, 1997, p.1.
[35] *Ibid*.

strategies from other developing countries in fulfilling food safety requirements through the implementation of HACCP will be explained. At the end of this chapter, an analysis of factors that have enabled developing countries to properly adopt HACCP and thus gain the most benefit will be presented and compared to those of Indonesia's. Finally, in Chapter 6 conclusion with policy recommendations on what the government could do to increase firms' participation and capacity to implement the HACCP. The recommendations will be based on the comparative studies of other developing countries, taking into account the findings in the literature review and the interview with the Ministry of Marine Affairs and Fisheries of Indonesia.

2. LITERATURE REVIEW

The concept of HACCP surfaced in 1959 when NASA collaborated with the Pillsbury Company to develop food for space use that is safe from any contaminants. Before this period, the customary method to produce safe food was through end-product testing. This method was ineffective since most of the space foods produced ended in laboratories, leaving only a small portion to be utilized. To deal with this issue, new approaches were devised with the aim to reduce the costs in achieving zero food risk. A method known as a preventive system consisted in the control over raw materials, food making process, the surrounding environment, personnel involved, storage and the distribution chain through record keeping. This method was a breakthrough since it required processors to be familiar with the raw materials, which was not a common practice at that time. The term 'food traceability' also coined during this time and described mechanism to trace food problems back to the initial source of contamination, which could be the raw materials, the plants or the people involved. This new system serves as the foundation of the HACCP in the food industry that we know today.[36]

In early literature, it was identified that costs and benefits of a quality management system as seen from firms' perspective were hard to define in precise economic terms. One method was to compare firms' profit before and after the system put in place. However, such a method omitted significant portions of costs and benefits that were not quantifiable, such as multiplier

[36] A summary of: Bauman, H.E., 'Chapter 1: The Origin and Concept of HACCP', *HACCP in Meat, Poultry and Fish Processing (Advances in Meat Research)*, Springer, 1995.

effects resulting from satisfied or dissatisfied customers, the enhancement of long term productivity and positive influence on employee morale.[37]

In 1998, Cato explained the reasoning behind the application of HACCP in food industry and established the economic foundation of the system.[38] In this study, seafood safety was defined as the intrinsic value referring to the risk level associated to human health upon the consumption of seafood products. Seafood *safety* was differentiated from seafood *quality* which is the extrinsic value related to appearance, odor, flavor and texture of the seafood. Good quality seafood does not always mean that the seafood is safe for human consumption.[39] Seafood safety is of greater concern for consumers than producers; however, it is not readily observable by the consumers.[40] Thus, government intervention is needed to ensure the accountability of the producers to provide safe food to the consumers.

One way to regulate the market is by obliging producers to apply various risk-reducing programs such as HACCP. Risk-reducing programs are perceived to be more effective in reducing food-borne illness and more cost-effective compared to end-product testing or providing information to consumers.[41] The seafood safety is also a concern for the producers given that consumers respond negatively to the presence of food hazards. Consumers usually respond by avoiding the product or switching the brand, which correspond to market loss for the producers.[42]

The net economic impact of HACCP is determined by comparing not only the costs and benefits experienced by firms, but also the consumers. While the costs and benefits for consumers were quite clear, there are two different hypotheses when it comes to those for firms. The first hypothesis places emphasis on a large marginal benefit after HACCP implementation as a measure, meaning the cost of implementation is much less than the benefits received. The second hypothesis disagrees with the first and instead determines that marginal benefits must be properly calculated at each CCP to compare the risk reduction achieved and the investment made. [43] The first hypothesis was not proven in Cato's study while the second hypothesis was not

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[37] Pearson, A. M. & Dutson, T. R. (eds.), *HACCP in Meat, Poultry and Fish Processing (Advances in Meat Research)*, Springer, 1995, p. 164.
[38] Cato, J. C., 'Economics of Hazard Analysis and Critical Control Point (HACCP) Programs', *FAO Fisheries Technical Paper*, No. 381, Rome, FAO, 1998.
[39] *Ibid*, p. 11.
[40] The term 'safety' and 'quality' were used interchangeably as in the end both did affect consumers' preference.
[41] *Ibid*, p. 13.
[42] *Ibid.*
[43] *Ibid*, pp. 22 – 25.

elaborated. The summary of principal cost and benefits upon the implementation of HACCP can be seen in the table below.

Table 2.1. Summary of the cost and benefits of implementing HACCP

	Benefits	Costs
Consumers	- Safer food - More information on the consumed food - Medical costs saved	- Higher price
Firms	- Business management tools (reduce costs of raw materials inspection, specification and inventory; reduce variability and costs of operations; reduce marketing and sales costs) - Market share benefit (compared to the firms that do not implement HACCP)	- Cost to apply the HACCP - Changes in market structure in which smaller firms are forced to the point of plant closures - Decline in the quantity demanded due to higher prices

Source: Cato, 1998. Compiled by Author.

This study also gathered various data on the cost estimation of HACCP implementation during 1997 to 1998 at industry and firm level. The data should not be used as a costs prediction for other firms at different countries operating under different circumstances. However, it is important to help identify the sources of the costs for the implementation of HACCP. At the industry level, it was estimated that US seafood industry spent US$677 million to US$1.488 billion during 1997 to implement the HACCP.[44] The costs consisted of employee training, HACCP plan refinement, sanitation audits, costs of implementing CCPs, equipment cleaning, record review, eliminating pests and administrative costs. It was found that smaller plants suffer greater additional costs due to decrease in quantity demanded resulting from higher price, which at some point pushed them out of the market.[45] At the firm level, the source of principal costs for

[44] *Ibid*, p. 26.
[45] *Ibid*.

each processing plants are different, depending on the products. Table 2.2 summarizes the costs suffered by various processing plants in the US during the time of the study.

Another important finding is the impact of HACCP on Argentinian processing plants for frozen blocks of hake fillets and salted anchovy. Using the Prevention, Appraisal and Failure costs model (PAF), it was found that the HACCP contributed positively to the effectiveness of quality management system in the plants. The failure costs decrease below 20% of total quality cost. At the same time, total quality cost fell from 40% to 21% of total production cost when the level of product quality is increased from poor to very good. [46] Main controllable costs in these plants included the inspection of raw material, training of employees and production control.[47]

The highlight of this study is that the most important role of HACCP for firms is its contribution as a business management tool. The system benefits the company by reducing failure costs resulting from food hazards. The key for firms to reap this benefit lies in the continuous training of human resources. Surveys indicated that 92% of manufacturing firms and 75% of service firms use employee training to enable changes made through quality management programs. Human resources development is easier in highly concentrated industry. But, it is challenging for the seafood industry that is widely characterized by disaggregated processing system.[48]

At first glance, the design of the HACCP system seems to be the sole obligation of private operators to implement and that government might play a small role. However, the study by Ababouch described that government must share the obligations to reach an effective HACCP implementation throughout their territory. This study was conducted during the early implementation of HACCP in Northern and West African countries.[49] Operators indeed have the obligation to implement HACCP system by designing and developing the system as well as verifying the effectiveness from time to time. They invest their resources to ensure that their products are safe. Meanwhile, the governments are responsible for ensuring that the HACCP system is correctly designed and implemented. The verification is to be done in two major steps, i.e. document review to verify the plans and on-site inspection to verify the implementation.[50]

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[46] *Ibid*, p. 33.
[47] *Ibid*.
[48] *Ibid*, p. 23.
[49] Ababouch, L., 'The role of government agencies in assessing HACCP', *Food Control*, Volume (11), 2000, p. 138, retrieved 21/10/2014, accessible through www.elsevier.com/locate/foodcont
[50] *Ibid*.

In performing these two broader steps, governments should play an active role to see effective HACCP implementation at all steps. Governments are also encouraged to perform preliminary assessment of the HACCP plants to prevent deficiencies in the HACCP program and the implementation costs. The inspection agencies must also ensure that the prerequisite programs have already been implemented correctly prior to the HACCP design.[51] Additionally, time-to-time assessment of the operators' management commitment and personnel competency are needed once the plan has been implemented. Another important aspect of governments' obligation is in relation to the dissemination of new information to food processors on issues such as new hazards, new standards or monitoring procedures.[52] Overall, the study has suggested that government plays an active role in assuring HACCP implementation in a country and must be proactive in pursuing the goal of HACCP. Governments are not only obligated to provide public infrastructure such as transportation or financial supports, it must also be familiar with the system and have personnel who have specific knowledge on food safety management and thus verify correctly.

In 2000, Henson and Loader[53] found that SPS requirements are the main market access barriers for agricultural exports from developing countries. Developing countries are not able to fully benefit from the liberalization of tariffs and quotas on agricultural trade since the reduction of tariffs comes with the emergence of compulsory SPS measures. There are at least three effects of SPS measures on trade. First, the measures may prohibit trade flow to the point of an import ban by increasing production costs. Second, they might divert trade from one exporting country to another depending on the country's ability to meet the required standards. Lastly, the cost of compliance might be higher for the exporting country suppliers compared to those in the domestic industry.[54]

They have identified the key challenges faced by developing countries to comply with EU's SPS requirements using survey results of 65 low and middle-income countries. Many of the surveyed countries agreed that the process-based requirements – as enforced by EU Competent Authority, are more burdensome to meet than border inspections.

[51] *Ibid*, p. 140.
[52] *Ibid*.
[53] Henson & Loader, See note 21, pp. 85 – 102.
[54] *Ibid*, p. 89.

Table 2.2. Sources of Costs in implementing HACCP for different processing plants:

Processing plants	Sources of costs
Surimi, clams, blue crabs, raw and breaded fish fillets, cooked ready-to-eat shrimp, catfish, trout, herring, salmon and raw breaded shrimp	(1) Human resources to design and implement HACCP plan; (2) human resources to monitor the CCP and to perform record keeping; (3) capital required to automate record keeping; (4) consultant fees to verify the required critical limits.
Breaded, cooked and raw shrimp plants and raw fish processing plants	(1) Plant closures of 14 out of 249 plants; (2) costs to the processors directly related to complying with the requirements of HACCP models; (3) consumer effects indirectly related to three compliance requirements; and (4) further impacts on shrimp processors as a result of changes in consumption patterns. Note: The investment needed to comply with HACCP was eight times more for smaller firms compared to larger firms.
Cooked ready to eat blue crab	(1) the complexity of the production process; (2) the plant managers' level of knowledge about HACCP procedures and their familiarity with planning and equipment; (3) the availability of assistance from trade associations, agencies and publicly funded training programs; (4) the plant's access to sources of capital for up-front investment costs; (5) the ability of the plant's workers to be trained and the speed of employee turnover; and (6) the plant's ability to spread costs over a large volume of product or to find ways to limit the fixed cost of equipment.
Smoked and Cured fish	(1) plant closures; (2) cost to processors directly related to complying with the requirements of HACCP models; (3) consumer effects indirectly associated with these compliance activities; and (4) further impacts on smoked and cured fish processors linked to a change in consumption patterns

Source: Cato, 1998. Compiled by Author.

Fishery products are the most affected products in which such requirements had directly prevented the products from reaching EU market.[55] The difficulties are very much attributable to the constraint in compliance resources, such as the access to information about the SPS requirements, the availability of technical expertise, financial constraints and limitations in administrative arrangements for compliance controls. The table below shows the key problems in meeting EU SPS requirements sorted by its significance for the surveyed countries. A smaller mean score implies a higher significance.

Table 2.3. Mean significance scores for problems in meeting SPS requirements in exporting agricultural and food products to the EU.

Factors	Mean score
Insufficient access to scientific/technical expertise	1.6
Incompatibility of SPS requirements with domestic production/marketing methods	2.1
Poor access to financial resources	2.6
Insufficient time permitted for compliance	3.0*
Limitations in own country's administrative arrangements for SPS requirements	3.1*
Poor awareness of SPS requirements amongst government officials	3.1*
Poor awareness of SPS requirements within agriculture and food industry	3.5
Poor access to information on SPS requirements	3.9

* Scores for these factors are not significantly different at the 5% level.

The HACCP is indeed burdensome for producers to implement but the rationales from behind it from consumers' and governments' viewpoints are understandable. Jensen pointed out that seafood safety issues have indeed becoming more vital in international trade as the result of the increase in consumers' exposure to food safety risk and the natural risk brought by the seafood. [56] An ever-growing exposure to food safety risks is the unavoidable implications from the increase in seafood consumption and the wider network of fish supply.[57] Besides, significant shares of fish imports are coming from developing countries where the safety of seafood processing is considerably riskier than their more-developed counterparts.

[55] *Ibid*, p. 92.
[56] Jensen, See note 9, pp. 591 – 598.
[57] *Ibid*, p. 596.

Moreover, fish products are relatively more perishable compared to other meat products and thus require special precautions. The levels of risk coming from various contaminants such as bacteria, viruses, toxins and chemical that can cause fish-borne illness are high throughout the food production chain. These risks however are not apparent in the end-products themselves, reflecting a lack of incentive for firms to ensure food safety throughout the production process. This condition has made the governments of importing countries left with no choice but to increase regulations on the safety of products by requiring a preventive mechanism such as HACCP to ensure compliance by the producing countries rather than end-product testing. [58]

In 2006, Bai et al. conducted a survey on Chinese food processors to evaluate the incentives for firm to implement HACCP and the results of the implementation. Five out of 27 respondents were large-sized companies (more than 2000 employees), 17 respondents were medium sized (300 to 2000 employees) and five others were small sized companies having less than 300 employees.[59] All respondents had implemented a full operating HACCP for at least 6 months. This study aimed to provide a pragmatic strategy for the Chinese government on how to increase food operators' participation in HACCP based on the assumptions and evidence that food safety requirements act as a catalyst for better industrial capacity.[60] This research informs governments on what drives the firms' incentives, thus help as guiding enforcement.

The survey has shown that 23 respondents had successfully implement HACCP in the course of a year or less while 4 others needed a year and a half. The previous implementation of ISO standards has helped firms to quickly adjust to HACCP system.[61] The incentives driving these firms to enforce HACCP requirements reflect the market conditions. The HACCP was perceived to give operators better chances to access new market and help improve product quality, thus increasing their market shares.[62] The incentives ranked from the most to least important are as follows: accessing new markets, increasing product quality, increasing market share, reducing production cost, complying with regulations and complying with customer's

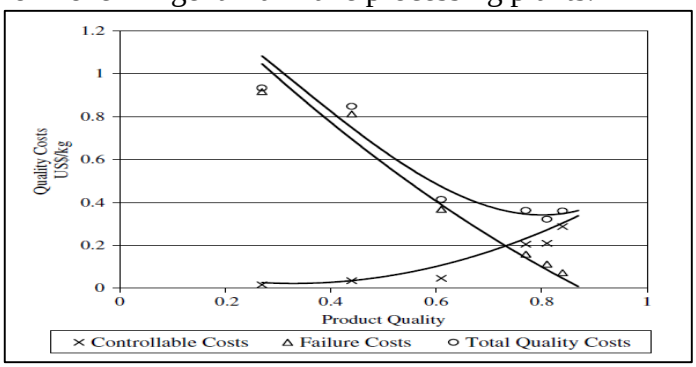
[58] *Ibid*, p. 597.
[59] Bai, et al. 'Implementation of HACCP system in China: A survey of food enterprises involved', *Food Control*, Volume (18), 2007, p. 1117, retrieved 21/10/2014, accessible through www.elsevier.com/locate/foodcont
[60] *Ibid*, p. 1109.
[61] *Ibid, p. 1110.*
[62] *Ibid.*pp. 1110 – 1111.

requirements.[63] It is interesting to see that the firms surveyed actually did agree to some extent that the implementation of HACCP reduced their production costs.

At the country level, it was found that small companies and non-exporters are not implementing HACCP. It was a problem since food processes are highly inter-related; a hazard might easily move from one food chain to another. Two solutions to induce firms' participation were proposed. First, regulatory bodies, trader societies and training services providers need to work closely to help the small players apply HACCP. Second, the food risks must be effectively communicated to domestic consumers to help shape consumers' preference, thus putting pressures on firms to adopt food safety requirements.

In 2007, Zugarramurdi et al. published the case study on Argentinian hake freezing plants to evaluate the effectiveness of HACCP implementation using the PAF model.[64] It was observed that when product quality increases from fairly poor to very good, the prevention and appraisal cost increase from 5% to 73% of total quality cost while failure costs decrease from 95% to 27% of total quality cost. The total quality cost has shown a decrease of 35% when product quality increases from good to very good.[65] The figure below further shows the comparison between the increase of prevention and appraisal cost and the decrease of failure cost. It is apparent that the company saves much more from the failure cost as compared to the money spent in the prevention and appraisal costs. This means that the benefit is greater than the cost for the surveyed plants. The authors claimed that a very good regression coefficient was obtained making the model quite precise.

Figure 2.1. Total quality costs, failure costs and controllable costs as a function of product quality for frozen Argentinian hake processing plants.



Source: Zugarramurdi et al., 2007.

[63] *Ibid*, p 1111.
[64] Zugarramurdi et al., 'Quality cost model for food processing plants', *Journal of Food Engineering*, Volume (83), 2007, pp. 414 – 421, retrieved 7/10/2014, accessible via journal homepage www.elsevier.com/locate/jfoodeng
[65] *Ibid*, pp 419 – 420.

A study by Lupin et al[66] found that the implementation of HACCP compensated exporters more than the loss resulted from failure to fulfill fish quality and safety requirements. The study was conducted on firm-level surveys across three Latin America countries in which the quality costs before and after HACCP were compared using the PAF method. Some general patterns were also drawn through surveys and interviews. With the same result as Bai et al., it was found that the application of HACCP increased the food safety level, and generally the system can be fully implemented in the course of a year.[67] The initial investment varies widely depending on a number of factors such as the distance of firm's current hygiene plan with the fully implemented HACCP system, the type of products, the technological ability, the plant size and the plant structure.[68]

The authors clearly identified the cost pertaining to the PAF calculation and gave a very concrete list of examples for each cost. The distinction between types of costs is important to help future research identify the cost and benefit of HACCP implementation. It also serves as a guidelines for operators by helping them decide in which parts of the process they should invest in. The total quality costs is a company's expenditures spent to fulfill the HACCP regulations of the importing countries that comprises of resulting costs and controllable costs. Resulting costs, or so-called failure costs, are the costs suffered by the firms related to inadequate compliance with the HACCP requirements and hygiene plans. Prevention and appraisal costs related to the design, implementation and maintenance of the HACCP system and the monitoring of all critical control points are budgeted by the firm upon the adoption of the system, hence are part of controllable cost.[69] Table 2.4 shows the list of cost and the categorization provided in this study.

The adoption of HACCP has successfully reduced the resulting cost portion in the total quality cost a firm needs to fulfill and maintain its fish quality. On average, the reduction of the resulting cost accounted for twice the amount of the increase in controllable costs while total quality costs reduce over time. This means that each dollar spent in controllable cost returns more than two dollars in failure-cost saving.[70] Overall, this study has found that HACCP, when

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[66] Lupin, H. M., Parin, M. A. & Zugarramurdi, A., 'HACCP economics in fish processing plants', *Food Control*, Volume (21), 2010, pp 1143 - 1149, retrieved 10/10/2014, accessible via journal homepage www.elsevier.com/locate/foodcont
[67] *Ibid*, p. 1147.
[68] *Ibid*, p. 1143.
[69] *Ibid*, p. 1144.
[70] *Ibid*, p. 1147.

applied, does pay fully for itself by helping the firm to increase its profit by reducing the total quality cost.

Table 2.4. Types of possible prevention, appraisal and failure costs in HACCP implementation

Prevention costs	Appraisal costs	Failure costs
- Planning, development and improvement of hygiene plans - Voluntary verification, audit, surveillance and maintenance of the system - Costs related to personnel training - Voluntary equipment verification or calibration	- Pre-production verification - Raw materials inspection - Materials used in tests - Mandatory verification, audit, inspections and evaluation - Documents keeping - Depreciation costs of plants' equipment - Final product analysis to test compliance	- Scrapped items and rejected products due to compliance failure - Replacement and repair of the material and equipment - Corrective actions and the process thereof - Unproductive personnel and facilities - Customer complaints and the costs thereof - Loss of market share, profit or sales

Sources: Lupin et al, 2010.

Summing up, the literature on the costs and benefits of HACCP has been evolving over time, with more support to HACCP as a catalyst for better performance. Although food safety is not the sole obligation of firms, they are indeed the principal players in determining the successful (or unsuccessful) application of a quality assurance system. The key to the successful application of HACCP lies in the willingness and capacity of firms. The willingness is determined by the costs and benefits comparison while the capacity varied from one firm to another, according to their economies of scale and financial resources.

The above statement implies that on one hand, the firms equipped with financial and human resources to implement HACCP will be able to gain long-term profit. On the other hand, small operators in developing countries suffer greater costs than their bigger counterparts. They have fewer resources to start a quality management system, let alone a full HACCP plan. On top of that, they are facing the same choices as their bigger counterparts. Given that the current market is a *buyers' market*, operators either profit from the HACCP or get replaced.

Thus, the debate on the impact of HACCP on developing countries' exporters is not between 'standards as a catalyst' or 'standards as a barriers'. Rather, it is an issue of distributional effect in the country itself. Governments must adopt this perspective in order to create an enabling environment for firms to actively participate in implementing HACCP. More focus should be put on how to reduce the cost for smaller players and to provide them correct resources in relation to HACCP implementation.

3. THE EU MARKET ACCESS REQUIREMENTS FOR FISH PRODUCTS

In addition to import tariffs, fish products coming into the EU face non-tariff measures, particularly in the form of quality and safety standards. The EU has by far the most stringent regulations for fishery products intended for human consumptions compared to the US and Japan. [71] Not only does it require certain standards to be met, it obliges the exporting countries to harmonize their domestic policy. The exporting countries must also have an EU-accredited Competent Authority to monitor the value-chain operations.

Fish products can be exported only after the issuance of various health certificates by the relevant regulatory bodies, both national and provincial, in accordance with EU regulations. The certificates are issued based on the following requirements: implementation of Good Manufacturing Practice, implementation of HACCP, internal audits and second party audits of suppliers, traceability of product, external audits by the Competent Authority, catch certificates and test certificates.[72] Upon arrival at the border, the certificates will be verified by officials at the border inspection point (BIP). Sometimes quality tests might also be performed. The EU also performs regular post-market surveillance which may result in increased border inspections or import suspensions if health risks found.

Although this research focuses on the HACCP requirement, it is very important to understand the EU food safety regime as a whole since the regulations are all interconnected with one another. The section below will explain the main regulations governing fish imports based on the information the author has received from the contact person at the Netherlands Center for the Promotion of Imports from developing country (CBI).

[71] Golub, See note 26, p. 11.
[72] *Ibid*, p. 118.

3.1. The EU's Food Safety Regime

In 2000, the EU began to adopt a new food safety concept. The concept was published in the Commission's White Paper on Food Safety that contains, among others, a requirement to ensure food safety on all production and processing stages along the entire food chain known as "stable to table" approach.[73] All fishery products intended for human consumption must comply with general health requirements related to: (1) country health approval, (2) approved establishment, (3) health certificates and (4) health control. Additionally, the EU also imposes a set of protective measures in case of dangerous disease outbreak.[74]

As a general principle, seafood is allowed to enter into the EU from approved countries and from approved establishments. The approved exporters must also source their raw materials from EU-approved origin.[75] The EU Food Safety requirements' key endorsement lies in the correct appointment of a Competent Authority in the third countries exporting to the European Union. A Competent Authority will monitor domestic processors activities to meet EU standards for the safety of imported fish and seafood. Careful inspections of the export farms, processors' vessels and safe food production processes are performed by the Competent Authority who will make sure that every step of the supply chain is equivalent to the EU's standards.[76]

In order to be included in the national register of exporting agents to the European Union, all individual companies must have the approval from the Competent Authority in each country. A country and its individual companies will be registered to the national registrar and be given a certification number.[77] A company is allowed to export to the European Union once it is on the list. This list is passed on to the European Commission where the information is made public. The countries having an approved Competent Authority are included among the so-called List I countries. Other countries that are in the process of gaining approval, but are deemed to be

[73] Stehfest, S. & Henning, J., 'Legal Structures of Food Safety in Europe', *The European Union Food and Feed Law Review*, Volume 2, 2014, p.115.
[74] European Commission, Trade Export Helpdesk, retrieved 6/9/2014, http://exporthelp.europa.eu/
[75] Vrignaud, S. *How to Export Seafood to the European Union – October 2013 Update*, National Oceanic and Atmospheric Administration, United States of America Department of Commerce, p. 8.
[76] Ababouch, See note 3, Table 10.
[77] According to the publication by DG-SANCO dated 8/8/2014, 198 of Indonesia's processing plants and freezing vessels are listed in the allowed establishments. The certificate were requested mostly in the second semester of 2008, new entrances are also adding up with the latest date of request was in June 2014. https://webgate.ec.europa.eu/sanco/traces/output/ID/FFP_ID_en.pdf

producing safe foods, are shown in List II. Shipments from List II countries are, however, subject to 100% border checks.[78] Indonesia is currently in the List I for its wild-caught[79] and aquaculture[80] products. All processors looking to export to the European Union must pass the certification process even if the processors have met the international food safety requirements. This creates hurdles for the processors as they need to go through the procedures set by the Competent Authority to be in the list of approved exporters.

The EU also actively performs random border inspections to verify whether the standards requirements have been implemented correctly. The border controls are done in three consecutive steps, starting with the certificates examinations followed by identity check and physical check. [81] Identity check is the process where the border inspector confirms the consistency between the certificates, while a physical check is the examination of the product itself and might include laboratory sampling and testing. [82] The health certificate must be treated with the utmost sensitivity by the exporting country. In the event of rejection of a product under a particular health certificate, the entire batch of products covered by the same health certificate will be rejected altogether. [83]

The food safety regime is also accompanied by the RASFF system that functions as a monitoring tool for food safety across Europe. Any notifications regarding food safety for food transported inside the EU or entering the EU are recorded in the system in a timely manner. There are two types of notifications; border rejections and market notifications. The market notification is divided into three types in accordance to the severity of the hazard identified. First, alert notifications are used to notify the members that there is food or feed presenting serious health risk that need to be addressed immediately. Second, the information notifications notify members about the risk identified from products that are no longer in the market or because the risk does not require immediate response. Third, news notifications are for any news related to

[78] Ababouch, See note 76.
[79] Annex II of Commission Decision 2006/766/EC of 6 November 2006 establishing the lists of third countries and territories from which imports of bivalve molluscs, echinoderms, tunicates, marine gastropods and fishery products are permitted.
[80] Annex III of Commission Regulation (EC) No 1251/2008 of 12 December 2008 implementing Council Directive 2006/88/EC as regards conditions and certification requirements for the placing on the market and the import into the Community of aquaculture animals and products thereof and laying down a list of vector species.
[81] Vrignaud, See note 75, p. 11.
[82] *Ibid*, p. 11.
[83] *Ibid*, p. 10.

food and feed safety that might be of interest of the members but are not proven to be hazardous.[84]

New EU regulations on food safety put attention on the hygiene of imported items, the so-called hygiene package that became applicable in January 2006.[85] The new hygiene package places the main responsibility on the food business operators to provide safe food. Food safety must be ensured along the food chain, starting from the raw materials. The package also obligates the implementation of HACCP-based procedures as a tool to comply with all regulations related to the food hygiene. It also provides flexibility for food produced in remote areas and for traditional food production.[86]

The hygiene package is divided into several regulations, which are explained as follows: (1) Regulation (EC) No 852/2004 on the hygiene of foodstuffs. It includes general and technical requirements for primary production, including HACCP.[87] (2) Regulation (EC) No 853/2004 on specific hygiene rules for food of animal origin. Specifically, Annex I on definition, and Annex III Section VII & VIII on bivalve mollusks and fishery products.[88] (3) Regulation (EC) No 854/2004 on specific rules for the organization of official controls on products of animal origin intended for human consumption. Annex III of the regulations concerns the checking, inspection, handling, temperature and the cleanliness of fresh fish landed directly from a fishing vessel flying the flag of a third country and all facilities and personnel related to the vessel.[89] These regulations are followed by several implementing measures and technical regulations such as microbiological criteria for foodstuffs, recognized testing methods to detect toxins and the model health certificate.[90] There is also Regulation (EC) No 2976/2005 which laid down transitional arrangement for exporting countries to implement the new hygiene system.[91]

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[84] Banati, D. & Klaus, B. '30 Years of the Rapid Alert System for Food and Feed: An overview on the European Alert Network, combined with a case study on melamine contaminated foods', *The European Union Food and Feed Law Review*, Volume 1, 2013, p. 15.
[85] European Commision, DG – SANCO, Food and Feed Safety Overview, retrieved 20/10/2014, http://ec.europa.eu/food/food/biosafety/hygienelegislation/comm_rules_en.htm
[86] *Ibid.*
[87] REGULATION (EC) No 852/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 on the hygiene of foodstuffs, retrieved 18/10/2014, http://eur-lex.europa.eu/
[88] REGULATION (EC) NO 853/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 laying down specific hygiene rules for food of animal origin, retrieved 18/10/2014, http://eur-lex.europa.eu/
[89] REGULATION (EC) No 854/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 laying down specific rules for the organization of official controls on products of animal origin intended for human consumption, retrieved 18/10/2014, http://eur-lex.europa.eu/
[90] European Commission, See note 74.
[91] *Ibid.*

3.2. The HACCP Requirements

HACCP is defined as "a science-based system that aims to prevent food safety problems from occurring rather than having to react to non-compliance of the finished product".[92] It is a risk-management tool that covers each product type at each step or procedure in the process from point of harvest through unloading, transportation, storage or processing by identfying all potential hazards that might occur.[93] An effective HACCP plan is proactive and preventive in nature. Operators are expected to be fully aware of hazards when it occurred, prevent the hazards from reaching consumers, asses the underlying reason on why the hazards occurred and set corrective actions to eliminate the hazards.[94]

In 2004, the EU has imposed general hygiene requirements in accordance to the HACCP system as stipulated in Article 5 of Regulation (EC) No 852/2004. Under the system, all fish exporters wishing to export to the EU must obtain certification and go through inspection and testing from time to time to ensure that the fish met the stipulated requirements.[95] The requirements cover a board range of standards such as the tolerance limits for antibiotics, heavy metals and pathogens inside the fish or fish products. It also covers packaging and labeling requirements.[96] Similar to other EU's food safety requirements, the enforcement of HACCP is under the auspices of a Competent Authority in each exporting countries.

The implementation of HACCP requires scientific research capacity to determine the potential hazard along the fish value chain. One example is the study made by Hamada-Sato et al. on determining the temperature needed to keep fresh fish fresh. They have found that a simple organoleptic test is not sufficient to determine the freshness of fish. The freshness of fish was determined by calculating the changes of various enzymes found in the fish muscles.[97] Although this research focused on the quality more than the safety of fish, it serves as an example of the

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[92] Codex Alimentarius Commission, *Code of Practice for Fish and Fishery Products 2nd edition*, Rome, 2012, p. 32., retrieved 19/10/2014, http://www.codexalimentarius.org/
[93] *Ibid*, p. 34.
[94] *Ibid*, p. 50.
[95] Henson, S., Saqib, M. and Rajasenan D., 'Impact of Sanitary Measures on Exports of Fishery Products from India: The Case of Kerala', *Agriculture and Rural Development Discussion Paper*, World Bank, 2005, pp. 13-15
[96] *Ibid*, pp. 18 – 19.
[97] Hamada-Sato et al., 'Quality assurance of raw fish based on HACCP concept', *Food Control*, Volume (16), 2005, p. 304.

importance of scientific research activity for the fulfillment of HACCP. The result was that each type of fish reacted differently under different temperature.[98]

This finding helps firms establish a quality management plan by preventing them to spend unnecessary costs especially those related to the storage, transportation, distribution and movement at the dock. The exact level of temperature they need to keep the fish fresh according to their particular need is important to be identified beforehand. The detail of the result is in the table below.

Table 3.1. The tolerance days of various fish under different temperature

	Tolerance days for given temperature			
	5℃	0℃	−10℃	−20℃
Blue Marlin	8	14	78	85
Sailfish	8	10	37	69
Skipjack	2	2.5	90	140
Pacific mackerel	2.5	3.5	60	90
Horse mackerel	3	4	60	140
Yellowtail	2	2.9	76	118

Source: Hamada-Sato, et al, p. 305.

According to the FAO, HACCP consists of seven principles: hazard analysis, determination of the CCP, CCP monitoring, corrective actions, procedures for verification and a documentation procedure. The application of these principles starts by establishing an expert team, having appropriate knowledge for the specific product. The product itself must be described in a very detailed manner. This includes the composition, chemical structure, treatments, packaging, and storage and distribution method. Also, the expected usage of the product and the end consumers, must be identified.[99]

An implementing team should make a flow diagram that covers all steps of the operation, taking into account the actual processing operations during all stages and hours of operation. Once the food chain is identified, hazard and potential hazards must be analyzed. The likelihood

[98] *Ibid*, p. 305.
[99] FAO, 'Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for Its Application', *Annex to CAC/RCP 1-1969, Rev. 3*, 1997, retrieved 14/07/2014, http://www.fao.org/docrep/005/y1579e/y1579e03.htm

of hazard occurrence, the severity level and the conditions leading to the hazards are to be included. Control points will then be established to overcome the hazards. There can be one CCP for multiple hazards or multiple CCPs for one hazard depending on the identified process. In the case where no appropriate CCP can be established, the production chain is to be modified. However, if modification is not possible, the CCP must be established at the earlier or later stage. At each CCP, the maximum measures, the so-called critical limits must be determined. Compliance with the limits must be ensured by a monitoring system which includes specific corrective actions and verification procedures. Also, the output of each step must be accurately documented.[100]

The Directorate General for Health and Consumers of the EU (DG-SANCO) has published various prerequisite requirements to be met before implementing HACCP similar to those required by Codex guidance. These requirements include: infrastructural and equipment requirements, requirements for raw materials, the safe handling of food (including packaging and transport), food waste handling, pest control procedures, sanitation procedures (cleaning and disinfection), water quality, maintenance of the cold chain, the health of staff, personal hygiene, training, traceability (Article 18 of Regulation (EC) No 178/2002) and competent authorities (Article 19 of Regulation (EC) No 178/2002). [101] The EU regulations give flexibility for the producers to implement the HACCP system in accordance with the size of the business.

[100] *Ibid.*
[101] DG SANCO, 'Guidance document on the implementation of procedures based on the HACCP principles, and on the facilitation of the implementation of the HACCP principles in certain food businesses', 2005, p. 9.

4. INDONESIAN FISHERY INDUSTRY

Indonesia is the largest archipelago in the world with a total area that spans 7.7 million km^2. It is the fourth longest coastline country in the world and has more than 17 thousands islands. It has historically supported the thriving development of fisheries activities as well as the growth of the industry for that matter. Sea waters compose of 76% of Indonesia's surface area along with 5,500 rivers and lakes.[102] Altogether, these provide for both wealthy wild-catch resources as well as high aquaculture activity.

According to the latest statistics published by the MMAF, the most exported products are shrimp (HS 0306) and tuna (HS 0301, 0302, 0303, 0304 and 1604). In 2012, Indonesia's exports to the EU accounted for 7% of its total fish exports, US$444 million out of US$3.8 billion. Compared to the year before, Indonesia's total fish exports had an increased rate of 6.02% in volume and 9.4% in value; however, its exports to the EU dropped 14.87% in volume and 3.05 in value. A majority of the exports to the EU were comprised of tuna and shrimp. More specifically, tuna exports to EU accounted for US$123 million while shrimp accounted for US$111 million.[103] Some other relevant statistics are explained as below:

a. The contribution of the fish industry to Indonesia Gross Domestic Product (GDP)

In 2013, the fisheries sector contributed 22% of Indonesia's GDP for agricultural group and 3.2% of its total GDP.[104] The real contribution of the industry to the livelihood of the population is even larger given that there are several economic activities closely linked to fishing and aquaculture activities. More detail can be seen in the table below.

Table 4.1. The contribution of Indonesian Fishery Sectors to the GDP in Million IDR

	2000	2009	2010	2011	2012	2013
Total GDP	1389769.9	5606203.4	6446851.9	7419187.1	8229439.4	9083972.2
GDP from Fishery	30410.6	176620	199383.4	226691	255367.5	291799.1
In%age	2.19%	3.15%	3.09%	3.06%	3.10%	3.21%

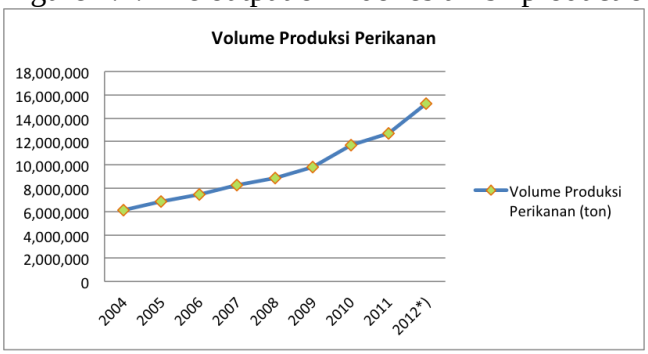
Source: Statistic Indonesia, http://www.bps.go.id/ (retrieved June 2014), compiled by author

[102] Indonesia Investment Coordinating Board (IICB), 'Fishery Industry at Glance', 2001, p.1., retrieved 9/7/2014, http://www.bkpm.go.id/img/file/fisheries.pdf
[103] DGFPPM, See note 30, pp. 1163, 1142, 1145.
[104] Statistics Indonesia, 'Gross Domestic Product at Current Market Prices By Industrial Origin (Billion Rupiahs), 2000-2013', retrieved 14/7/2014, http://www.bps.go.id/

b. The development of fish productions

The average fishing production volume has increased roughly 2.09% from the 2005-2009 period with main commodity being tuna.[105]

Figure 4.1. The output of Indonesia fish productions in Tonnes (2004 – 2012)



Source: MMAF Statistics, http://statistik.kkp.go.id/ (retrieved June 2014)

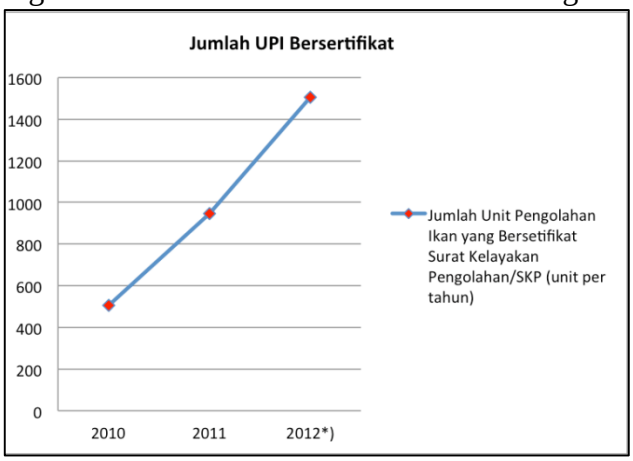
c. The number of certificates granted to processing plants

Figure 4.2 shows the number of *Certificate for Processing Eligibility* (SKP) granted to fish processors. The certificate is one of the prerequisite for firms to obtain HACCP certificate in accordance to *Ministerial Regulation No. PER. 19/MEN/2010 on "Control mechanism for the safety and quality assurance of fishery products"*. It was stipulated that SKP can only be obtained after seafood processors have proven that *Good Manufacturing Practice* (GMP) and *Sanitation Standard Operating Procedures* (SSOP) have been implemented in the plants.

The number of firms obtaining the SKP increased rapidly between 2010 and 2012 with an average growth rate of 73.29%. Meanwhile, the number of *HACCP certificates* granted has fluctuated over time, accounting for 1,371 certificates in 2006 down to 903 in 2007, 951 in 2008, and 901 in 2009 before increasing to 1,085 in 2010. The decrease in HACCP certificates does not necessarily represent stringent regulations or lower firm participations given that the number of actively producing firms were also fluctuating during this period.[106]

[105] IICB, See note 102, p. 2.
[106] Fish Quarantine and Inspection Agency, MMAF, 'Rencana Strategis 2011 – 2014' (Strategic Plans 2011 – 2014), MMAF, 2011, retrieved 25/10/2014, http://www.bkipm.kkp.go.id/files/regulasi/Renstra_BKIPM_2011_2014.pdf

Figure 4.2. The number of SKP certificates granted to Indonesian fish processing plants.[107]



Source: MMAF Statistics, http://statistik.kkp.go.id/ (retrieved June 2014)

d. The employment in the fishery industry

As shown in table below, employment in this sector increased overtime. However, the employment rate fluctuated from year to year with significant decrease between 2007 and 2011.

Table 4.2. The number of household employed in Indonesia fish industry (2007 – 2011)

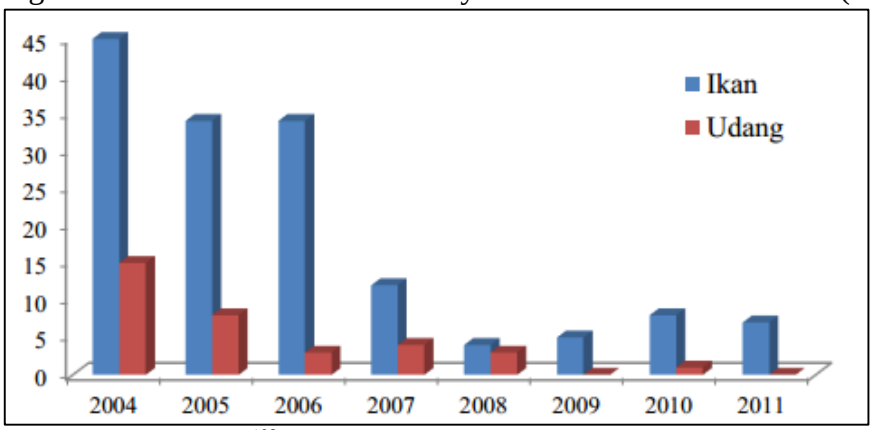
Year (Y)	2007	2008	2009	2010	2011
Fishing	1338758	1359053	1380497	1667949	1575787
Aquaculture	958499	939016	913788	891505	920129
Total	2297257	2298069	2294285	2559454	2495916
$\Delta Y=Y_{(n)}-Y_{(n-1)}$	-82155	812	-3784	265169	-63538

Source: Statistic Indonesia, http://www.bps.go.id/ (retrieved June 2014), compiled by author

According to the data recorded in the EU's *Rapid Alert System for Food and Feed* (RASFF), the amount of notifications coming from Indonesia fish exports has reduced over time. The figure below is a summary of all notifications, i.e. alert notification, information notification and border rejection during the period 2004 to 2011. Blue bar represented fish while red represented shrimp and the y-axis represent the total notifications. The newest number of RASFF notifications will be discussed at sub-chapter 4.4.

[107] (1) No data was recorded prior to 2010 and (2) Average growth being 73.29 percent.

Figure 4.3. Notifications recorded by RASFF for Indonesian fish (2004 – 2011)



Source: Nababan, p.54.[108]

4.2. Regulatory Environment for Seafood Production in Indonesia

The regulations and the governing bodies involved in seafood safety assurance are still rapidly evolving at the time of this research. The first regulations governing food safety was published in 1996, *Law No. 7/1996 on "Food Safety"*. The regulation governs all scope of food related matters such as the production, transportation, distribution, packaging, and trade of food, genetically modified food source, food hygiene, safety and quality. This is followed by the *Government Regulation No. 102/2000 on "National Standardization" amending Government Regulation No. 15/1991 on "Indonesian National Standardization"* which is set as the foundation of the accreditation and certification procedure in Indonesia in which food before allowed to be distributed must have appropriate 'standards number' in its packaging. The 'standards number' can be obtained after various assessments have been completed by the National Standardization Agency.

The earliest regulation on fish is the *Law No. 9/ 1985 on "Fisheries"* which covered the livelihood of fishermen, the economic zone for fishing and sustainable fishing methods. This regulation does not provide much in relation to the practical aspect of seafood quality and safety assurance. In 1998, the Marine and Fisheries Department (under the Ministry of Agriculture) –

[108] Nababan, S. C., Penerapan Kebijakan Perdagangan Internasional di Uni Eropa dan Pengaruhnya Terhadap Ekspor Udang Indonesia, Student Thesis, Bogor Agricultural University, p. 37., retrieved 18/10/2014, http://repository.ipb.ac.id/ (The data prior to 2008 was not accessible at the RASFF portal, thus author could not compiled the data herself).

now MMAF,[109] published *Ministerial Decree No. 41/KPTS/IK.210/2/1998 on "The Integrated Quality Management System of Fishery Products"* which stipulated that all seafood processing units in Indonesia must adopt HACCP system. This regulation contains various umbrella clauses on multiple factors affecting seafood safety such as raw materials, additives, water, sanitation procedures, personnel hygiene and preventive measures.[110] The decree also stipulated that any fish products intended to be exported must have a *Certificate of Quality* and a *Health Certificate* that can be obtained after inspection and testing in accordance to the standards and guidance set by The National Standardization Body of Indonesia (BSN).

The first regulation establishing HACCP as compulsory for all fish processor is the *Ministerial Decree No. KEP. 01/MEN/ 2007 as amended by Ministerial Decree No. PER. 04/ MEN/ 2008 on "Requirements on the seafood safety and quality assurance for the production, processing and distribution of seafood"*. This regulation identified seven principles of HACCP as compulsory for all seafood processing units and stated that HACCP implementation is to be catered to that of international standards and destination countries'. It covers the requirements of hygiene and sanitation procedures during fish processing and makes GMP and SSOP a compulsory pre-requisite for HACCP implementation. Besides regulating the fish processing unit, it set out several technical requirements that must be fulfilled by downstream operators such as the design of fishing fleets, on-board cold storages and freezers, hygiene and sanitation procedure on fishing fleets and landing areas, cold chain temperature during storage and transportation and fish handling at the auction area.

Currently, fish processors wanting to operate in Indonesia must fulfill a large number of technical regulations governing different aspects of seafood safety. Processors wanting to export their products are obliged to obtain additional HACCP certificate. The main regulations governing HACCP implementation for seafood safety assurance consist of:

- *Ministerial Regulation No. PER. 19/MEN/2010 on "Control mechanism for the safety and quality assurance of fishery products"*. This regulation supersedes *Ministerial Decree No. KEP. 01/MEN/ 2007* and has a broader scope of seafood-safety assurance. It mandates not only HACCP certification for processing units, but also safe handling certifications for fishers and fish farmers. It also requires processing units to apply GMP and SSOP and to

[109] Presidential Decree No. 47/2009, MMAF established as a separate ministry from the Ministry of Agriculture.
[110] *Ministerial Decree No. 41/KPTS/IK.210/2/1998 on "The Integrated Quality Management System of Fishery Products"* http://bpkimi.kemenperin.go.id/bpkimi/extension/panduan_iso/doc/uu/J00-1998-00041.pdf

acquire a SKP certificate through on-site verification by DGFPPM as prerequisites to adopt HACCP system.

- *Regulation of the Competent Authority No. PER. 03/BKIPM/2011 on "Technical guidance on the implementation of safety and quality assurance of fish products".* This regulation establishes the Competent Authority and its responsibility to verify, inspect and certify processing unit on the implementation of HACCP and its authority to include (or exclude) processors in the national export registrar. The procedural guidance for a Competent Authority on the appointment of testing laboratory, the establishment of inspecting teams and auditor teams, the guidelines for inspecting and auditing schedule, the appointment of head inspectors, and the audit and inspection process were also elaborated. It also set the guidelines for processing units wishing to obtain HACCP certificates and to be listed in the national export register.

The governing bodies for seafood safety have also evolved over time due to the change of Ministry of Agriculture organizational structure and organizational problems. In 2007, DGFPPM, a body under Marine and Fisheries Department of the Ministry of Agriculture was stipulated to be the Competent Authority for fish safety and quality control.[111] It was responsible for verifying safe handling in the landing areas, fish transportation, processing plants and the distribution channel. It also assigned inspection, testing, surveillance and certification to designated provincial authorities. The DGFPPM ensured uniformity in standards implementation and delegates its authority to Directorate General of Aquaculture (DG-A), Directorate General of Caught Fisheries (DG-CF) and provincial authorities.[112] DG-A is responsible to verify compliance of the aquaculture farms by monitoring drug usage and inspecting the installation of the farms from the hatcheries to the harvest. DG-CF is responsible to verify compliance of the fishing and freezer vessels as well as the unloading process from fishing vessels. Meanwhile, the provincial authorities support both DGs by performing laboratory testing and on-site inspection.

The dissemination of new technologies in the aquaculture sector was interrupted in 2008 due to the cumbersome institutional problems. Soon after the DGFPPM became part of the Marine and Fisheries Department, the 'extension network' for the dissemination of information which was built for all agriculture products was not accessible by DG-A. The condition prevented

[111] *Ministerial Regulation 01/MEN/2007 on 'The Control of Fish Quality and the Safety Assurance System'*.
[112] Lord, See note 29, pp. 111-112.

the farmers from receiving training and getting new information on time.[113] A similar situation might have happened to the DG-CF given that both were under the supervision of the Marine and Fisheries Department.

In 2009, organizational mis-management occurred between the Fish Quarantine Center – whose competence is to publish *fish health certificate* (indicating the fish is free from fish diseases) and DGFPPM – whose competence is to publish *the health certificate* (indicating the seafood is safe for human consumption). The root of the problem was the misunderstanding of health certificate at custom check points. Customs officers at export check points only required *a* health certificate to accompany fish products wishing to cross the border. Since there was no differentiation in the terms used; *any* health certificate would allow the products to cross the border check point and be exported. Some exporters had illegally utilized this particular custom mechanism to avoid DGFPPM safety and quality certification system. Instead of going through the compulsory testing and inspection processes to obtain the *real* health certificate from DGFPPM, the exporters had successfully obtained health certificate from the Fish Quarantine Center through illegal channels.[114] To deal with this issue, the MMAF streamlined the organization structure by merging them to one department called the Fish Quarantine and Inspection Agency (FQIA) in 2010.[115]

FQIA is the current Competent Authority for the assurance of fish health, quality and safety of fishery products for both export and import. FQIA issues out the *real* health certificate, HACCP certificate and national registry number. As an Echelon 1 department (highest ranked body under a ministry), FQIA's scope consists of developing, coaching, monitoring and evaluating the fish industry to produce safe food across the country.[116] There are 45 'technical implementation units' under FQIA that perform quarantine, inspection and testing at the border checking points at each provincial port of Indonesia. The technical units also have their own posts at the airport, sea ports, and river ports to work with customs officers to ensure the correctness of the certificates before seafood crossing the borders.[117] Two 'think-thank'

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[113] Nurdjana, M., Indonesian Aquaculture Development, Delivered on RCA International Workshop on Innovative Technologies for Eco-Friendly Fish Farm Management and Production of Safe Aquaculture Foods, Bali, Dec. 4-8, 2006, p.61., retrieved 2/9/2014, http://www.agnet.org/htmlarea_file/activities/20110719101541/7.pdf
[114] Interview with the Head of International Fisheries Market Analysis, DGFPPM, MMAF, Jakarta, September 2014.
[115] *Presidential Decree No. 24/2010 and Ministerial Decree No. 15/2010 on "The Establishment of FQIA as Competent Authority for Fish Safety and Quality Assurance"*.
[116] The website of FQIA, retrieved 6/10/2014, http://www.bkipm.kkp.go.id/bkipm/profil
[117] *Ibid.*

departments whose function is to assist the technical implementation units are: the center of fish quality and safety certification and the center fish of quality and safety management. These departments formulate standards, criteria and procedures for certification process; conduct monitoring function and produce evaluation reports.[118]

Summing up, the country has had its seafood safety regulations catered to the EU's standards on HACCP, GMP and SSOP. The governing body for safety and quality assurance in the fish industry is the FQIA – a newly established body under MMAF. FQIA is the appointed Competent Authority who is responsible to inspect and certify exporters and list them in the national export registry. Since its establishment, FQIA has been actively coordinating with national customs points to better the surveillance on seafood crossing the border.

Despite the efforts made, seafood problems as recorded in the RASFF still persist. The RASFF records serve as an indication that there is still room for the Indonesian fish industry to improve their safety and quality assurance system. The next two sections will describe the supply chain and players involved in the industry followed by the narratives of how HACCP has been implemented. Together, these will serve as the basis to analyze the potential source for problems in fish safety and quality assurance.

4.3. The Supply Chain of Indonesian Fish Industry

Given the large portion of SMEs involved, the industry generally operates through middlemen connecting farmers and fishery processors who then export the products directly. The middlemen buy the fish from the farmers, collect them and channel them to the processors or exporters. They bundle the products according to their quality to fulfill the need of fish processors and exporters. The role of middlemen is crucial. They are entrepreneurs that know the local market and thus dominate and ensure the flow of the fish supply chain. [119] A typical supply chain in Indonesia's fish industry starts with the assembly of production factors (for example: nets and ship for fishing, brood stocks, seed and chemicals for aquaculture) to the production of fish either through sea caught or farming. After the harvest, fish are collected by middlemen and go through post-harvest handling and storage before moving to processing plants. Some

[118] *Ibid*, p. 18.
[119] Lord, See note 29, p. 111.

processors export the final product themselves while smaller processors work with private export agencies.[120]

Wild caught fishery products are placed in cold storage before being moved to a landing site for distribution. The catches are then sold at auctions or are directly distributed to fish processors. Farmed products have a longer value chain starting from hatchery, nursery and then harvest. The farms are categorized based on the densities of seed stock per hectare. Each type of farm utilizes different types of feeds and medicines along its production process. Farms with high feed-stock density are called *intensive operations* in which production output per unit of space is high due to intensive use of capital and technology. The aeration, water exchange and diets are specially designed by the farmers. Farms with low stocking density, so called *extensive operations*,[121] rely on tide changes to feed the shrimp and has a lower production output per unit of space. The middlemen will act as collectors, collecting the product at collection points or directly from farmers and sort them by quality level and then sell them to the processors. The processing activities include washing, peeling, packing and freezing which are accompanied by inspection at every step.[122]

An example of frozen shrimp supply chain can be retrieved from a field study conducted in the processing plant of PT Central Pertiwi Bahari (EU Approval Number 515.08.B). The company has its own feed mills, hatchery and processing plants with 10 000 employees in 2008. The food chain in processing plan starts with receiving the shrimp, a first washing, a second washing, deheading of shrimp, a third washing, shrimp peeling, deveining, steaming, freezing, glazing and packaging. The high risk of contamination, especially microorganism and chemical change is found mainly after the peeling where deveining is done manually by factory workers.[123] The company implements preventive mechanism by taking water samples every two hours and shrimp sampling every one hour. During the whole process, excluding steaming and deveining, the product is constantly handled under low temperature with a maximum of 5℃.

[120] Ministry of Trade of Indonesia, export helpdesk, retrieved 7/9/2014, http://inatrims.kemendag.go.id/
[121] The term *extensive operations* and *intensive operations* will again be used in Chapter 5.1. of this research.
[122] *Ibid*, pp. 111 – 116.
[123] Nugroho, C., 'Evaluasi standar pengantian air dan rantai dingin terhadap mutu mikrobiologi udang di PT Central Pratiwi Bahari', Student thesis, Bogor Agricultural University, 2008, retrieved 18/10/2014, http://repository.ipb.ac.id/

4.4. Implementing HACCP in the Industry

Kok performed a needs assessment of Indonesia's aquaculture industry to find out the willingness and ability of various stakeholders to implement traceability system in their operation. The drive to implement the system is bigger in the downstream level of production where the big processors export the end products directly to the EU. Some big suppliers (middlemen) have invested in standardized storing facilities and put efforts to connect to the traceability systems of the processors. The story is different at the level of fish farmers, where traceability is almost non-existent. Most farmers are smallholders who are not aware of the traceability system. They do not keep documentation on the origin of the brood stock or the pond characteristics. Most are also not familiar with the presence of exports rejections. The supplier bridging farmers and processors plays large role in documenting the origin of the fish.[124]

The MMAF had organized trainings to introduce HACCP to fish farmers, suppliers and processors through multiple workshops across the country. The stakeholders are generally interested in adopting the system given that it is a requirement to be in the export supply chains. The methodology used in the training consisted of lectures, case studies and group assignments. The participants were introduced to the basic characteristics of traceability and the practical information to implement the system.[125]

Despite the trainings and the improved regulatory environment, the latest data recorded in the RASFF still suggests that there are 32 border rejections notifications for fishery products during 2008 – 2014. The highest number of border rejections recorded was in 2012 with total of 7 rejections and 2010 with total of 6 rejections. The product with highest number of rejections is tuna, which accounted for 13 cases while shrimp were rejected three times. The main cause of rejections is the mercury level (10 cases) followed by insufficient temperature control (9 cases), histamine level (8 cases) and improper hygiene condition (4 cases).[126]

Histamine seems to be a persistent problem in Indonesian seafood industry. In 2004 there was a total of 39 histamine-related alerts, with 32 from tuna products.[127] In 2014, there were three

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[124] Kok. E. & van der Roest, J., 'Need of Traceability of Farmed Fish in Indonesia', *Okonomisk Fiskeriforskning*, Volume (19), 2009, pp. 21-22.
[125] *Ibid*, pp. 23.
[126] Data compiled from European Commission RASFF Portal, retrieved 18/10/2014, https://webgate.ec.europa.eu/rasff-window/portal/
[127] Fadly, N. 'Asesmen risiko histamine ikan tuna (*Thunnus sp.*) segar berbagai mutu ekspor pada proses pembongkaran (transit)', Student Thesis, Bogor Agricultural University, p. 14., retrieved 18/10/2014,

border rejections caused by histamine level in the processed fish.[128] According to the FAO, the risk of histamine is best to be mitigated by the application of HACCP.[129] This seems to imply that the Indonesian seafood industry does not yet have a fully functioning HACCP system. The histamine hazards are preventable by setting CCPs at particular steps of seafood chain such as the fish receiving point, the temperature control during *rigor mortis* period, the hazards exposure during thawing, brining, smoking, deheading and drying, final chilling and the refrigeration of finish products. These CCPs are needed to avoid the activation of enzyme, the contamination of bacteria and the reaction of certain chemicals that will lead to the formation of intolerable level of histamine.[130]

Dyspriani conducted the fieldwork by surveying 185 small-scale shrimp farmers (having ponds of less than 5 hectares) and 8 processing plants throughout four main islands: Sumatra, Java, Borneo and Sulawesi to assess the result of the 2005 Fishery Revitalization Program conducted jointly by Indonesian Ministry of Health, Ministry of Agriculture and the Marine and Fisheries Department (now MMAF). Parts of the program focused on creating responsible shrimp supply chain to fulfill food safety requirements at the export market. The study found that the program has failed to facilitate the capacity development of small farmers with the main causes including: insufficient government credit facility, lack of information, low level of farmers' education and the absence of formal organization to represent the small-scale shrimp farmers. [131]

The shrimp supply chains for both export and local market are quite long, starting from the hatchery to small collectors to traders (big collectors) to processors. Shrimp need to be sold immediately to collectors after farmed given that farmers usually do not have the cold storage facility, especially for small farmers. The shrimp collection activity creates problems of traceability since they usually mix up shrimp from different farming areas to grade them

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http://repository.ipb.ac.id/ (The data prior to 2008 was not accessible at the RASFF portal, thus author could not access the data herself).

[128] See note 120.

[129] FAO/WHO, *Joint FAO/WHO Expert Meeting on the Public Health Risks of Histamine and Other Biogenic Amines from Fish and Fishery Products*, Rome, 23 – 27 July 2012, retrieved 22/10/2014, http://www.fao.org/fileadmin/user_upload/agns/news_events/1_FAO-WHO_Expert_Meeting_Histamine.pdf

[130] US Food and Drug Administration, 'Scrombotoxine (Histamine) Formation', in *Fish and Fishery Products Hazards and Control Guidance*, USFDA, 2011, retrieved 23/10/2014, http://www.fda.gov/downloads/Food/GuidanceRegulation/UCM251970.pdf

[131] Dyspriani, P, 'Governance and the Study of Shrimp Revitalization Program in Indonesia', Student thesis, Norwegian College of Fishery Science, University of Tromso, 2007, retrieved 18/10/2014, http://munin.uit.no/

according to size.[132] If hazards occur, it would be difficult to trace it back to the farm let alone the brood sources.

The small-scale farmers are very dependent on middlemen cannot bargain for price or quantity. Some operates with low profit margin while some others sell young shrimp at low prices to fulfill the quantity requested. The financial disparity creates technical constraints where farmers are not able to carry appropriate sanitation method in their respective ponds. This is highly risky for the safety of the harvest. For example, shrimp have tendency for cannibalism; if one sick shrimp dies in the pond, it could easily contaminate the entire batch. Moreover, the small farmers are not as well-informed of safety requirements making them operate without any proper safety guidance.[133] The formal organization that works with DGFPPM to disseminate new information and technology has failed to accommodate the need of small-scale farmers. [134]

Summing up, Indonesia has a heavily disaggregated seafood supply chain that operates under a rapidly evolving regulatory environment. The bargaining power is held by middlemen since both farmers and processors are heavily dependent on them to provide sufficient demand and supply of the fish. The seafood processors' participation in HACCP practice is improving (at least quantitatively) as can be seen from the number of HACCP certificates published annually. However, small operators particularly at the upstream level are not familiar with the basic prerequisites – notably hygiene practice and traceability system. The conclusion to be drawn is that small-operators are willing to improve but are not capable to do so.

The next chapter will explain how other developing countries have coped with the HACCP by focusing on the strategy they are using to integrate smaller operators. Some strategy might be of interest for Indonesia government to improve the HACCP implementation in its fish industry.

[132] *Ibid*, p. 21 – 24.
[133] *Ibid*, pp. 27, 47.
[134] *Ibid*, pp. 27.

5. COPING STRATEGIES OF OTHER DEVELOPING COUNTRIES

5.1. Bangladesh

The main challenges regarding the assurance of safety and quality of seafood in Bangladesh's fish industry stem from the heavily disaggregated supply chain system.[135] Similar to Indonesia, Bangladesh's fish industry faces a complex distribution chain that prevents the fish industry from developing the needed capacity to produce export-grade fishes.[136] There are at least four different middlemen along the value chain for the fish to reach the final consumers. Not only do they reduce a fishers' profit margin, the process also leads to poor hygiene practice and high proportions of discarded catches. The prevailing complexity is also intensified by several problems of public infrastructure. The lack of public infrastructure for transportation, storage and loans are among the problems causing the fishers' inability to distribute the products themselves.[137]

In July 1997, the EU imposed a ban on shrimp exports from Bangladesh[138] after non-compliance with the HACCP was found at several stages of its industry – mainly during harvesting, sorting, deheading and deveining of the shrimp. The problems were caused by unhygienic practice, lack of transportation and cold storage infrastructure and intensified by the irregular electricity supply.[139] In response to the ban, Bangladesh started to adopt strict regulations on food quality assurances based on HACCP system in 1998.[140] Currently, the government is putting more focus in providing needed public infrastructure such as cold storage facility, transport, electricity and communication to shorten the seafood chain.[141]

HACCP implementation in the Bangladesh shrimp industry was better at the processing level than at the farming level. According to the survey performed by Haque in 2004, only one

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[135] Golub, See note 26, pp. 28-29.
[136] *Ibid*, p. 32.
[137] *Ibid*.
[138] Haque, A., 'Sanitary and phytosanitary barriers to trade and its impact on the environment: the case of shrimp farming in Bangladesh', TKN paper, IISD, 2004, p. 9., retrieved 24/10/2014, http://www.iisd.org/tkn/pdf/tkn_shrimp_bangladesh.pdf
[139] Grote, U., 'Environmental and food safety standards and international trade: concerns and challenges for developing countries', *International Symposium Sustaining Food Security and Managing Natural Resources in Southeast Asia, Challenges for the 21st Century*, Thailand, 2002, p. 9, retrieved 24/10/2014, https://www.uni-hohenheim.de/fileadmin/einrichtungen/sfb564/events/uplands2002/Full-Pap-S1-3_Grothe.pdf
[140] Uddin, M., 'Value Chains and Standards in Shrimp Export from Bangladesh and Thailand to Japan: A Comparative Study on Safety Compliances', *Asia-Pacific Journal of Rural Development*, Volume (19/1), July 2009, p. 92.
[141] Golub, *Ibid*, p. 35.

farm out of 105,000 was aware of the HACCP requirement. The *extensive farms operators* are dominant in the industry and, because of their small size, are unable to afford implementing the monitoring mechanism required under HACCP.[142] Also, according to the surveys performed in 2005, 100% of SMEs respondents identified standards requirements (including HACCP) as the most significant obstacles for Bangladesh shrimps to access the EU market.[143]

In 2009, HACCP system was implemented in all covering up to 85% of the shrimp value chain. Check points were established and monitored by Bangladesh's Department of Fishery along the supply chains starting from brood shrimp, hatchery, nursery, shrimp farm, village traders and then to the purchasing agents, depot owners, processing plants to the export activities.[144] The country was lacking in its laboratory testing capacity. Before it started to have its own testing facilities, it relied heavily on laboratories in other countries such as Thailand and Singapore.[145] Bangladesh had also taken good steps to ensure the traceability of the shrimp using 'suppliers certificate' coupled with 'farmers and region code' that helps integrate small-scale operators in the HACCP system.[146]

5.2. India

The failure to fulfill EU food hygiene requirements resulted in multiple bans in 1997 of India's fishery products. The government itself has made proactive initiatives since 1996 in which it organized training and assisted processing firms to comply with the HACCP. However, continued finding of *salmonella* during the EU on-site inspection resulted in bans in May and September 1997. Also, in 2002 and 2003, India has suffered plenty of EU border rejections based on antibiotics residue and bacterial inhibitors.[147]

The EU measures are the main drive for the implementation of India food safety control. As result of the EU ban in 1997, the government has made substantial efforts and has

[142] Haque, See note 138, pp. 10, 20.
[143] Haque, E., Karim, A. & Abdallah, W., 'Market Access Issues: EU – Bangladesh Trade Regime A Case Study on Market Access: Myths and Realities', IISD, 2005, p. 24, retrieved 24/10/2014, http://www.iisd.org/tkn/research/pub.aspx?id=746
[144] Uddin, M., See note 140.
[145] *Ibid*, p. 103.
[146] *Ibid*, p. 111.
[147] Henson, Squib & Rajasenan, See note 95, pp. 22-23.

successfully regained full compliance and thus market access in just 6 months.[148] The government quickly established an inspection council that fulfilled the requirement to be an EU-certified Competent Authority. This council performs inspections and monitors the activity of processing firms. By that, it also takes decisive actions when it comes to a firms' export activity. During 2002 some processing firms were required to stop production following problems related to antibiotics residue. On the regulatory side, the government put in place a complex factory approval system and a comprehensive certification system to assure checks and balances on food quality along the value chains.[149]

The government also shows its proactive efforts by establishing the maximum level of heavy metals and other environmental contaminants in 2001. Currently, the government is continuously upgrading the laboratories equipment and staff, the landing facilities and improving handling practices of the fishing boats – which are mostly done through subsidies.[150] The government addressed 2002 and 2003 detentions by prohibiting the use of antibiotics and other pharmacologically active substances in aquaculture. On top of that, India also established an agriculture advisory center at Brussel to monitor the changes in EU requirements.[151]

Following the government's actions, the private sector is required to upgrade their hygiene standards to implement the new procedures. Necessary changes in the pre-processing and processing facilities which often involved massive cost had to be made. Some firms struggle to finance these changes while operating under low profit margin. Despite the circumstances, firms are left with no choice but to comply given that very few facilities that delayed compliance are performing well.[152]

Addressing these challenges, the producers made collective actions by joining forces with the public sector through the Seafood Exporters Association of India. The association is involved in enhancing food safety capacity mainly through pooling and leasing infrastructure for the exporting firms such as pre-processing units, landing facilities, water and ice supply. The presence of an association also facilitates the interaction, thus information dissemination between the players in the industry. Together with the government, the association has implemented a

[148] *Ibid*, p. 23.
[149] *Ibid*, pp. 28 – 30.
[150] *Ibid*, pp. 25, 33, 36.
[151] *Ibid*, p 30.
[152] *Ibid*, pp. 41 – 45.

traceability system through improves computerized tracking.[153] The collective action is one way to integrate small-operators in HACCP implementation. It eases the distributional effects of the standards to support the integration of small-scale operators in the seafood safety enhancement efforts.

5.3. Kenya

Before the 1980s, Kenyan fisheries were dominated by fishing activity mainly done by small-scale operators using wooden crafts propelled by sail. The processing was mainly done through artisanal processors whose plants were located based on or near landing beaches, allowing them to have a continuing fish supply and demand. The role of middlemen were considered not substantial in the industry.[154] The situation changed after the 1980s after huge demand from developed countries reached the region. Since then, the artisanal fish processors shifted towards more industrialized plants, making the fishermen more dependent on the middlemen. The number of people employed in the sector has also decreased.155

The country faced periodic import restrictions from the EU during from the 1990s to 2000 with most cases highlighting the problems related to the hygienic state and pesticide residue.[156] A ban on exports of fresh fish from Kenya was enacted by Spain and Italy in November 1996. During this time, both countries accounted for 6.7% of Kenyan fish exports. The restriction was soon to be adopted by other EU members which resulted in a total ban in the first semester of 1998. The initial impact of the ban was the termination of fish fillet production altogether. During 1998 and 1999, fish exporters began to look for alternative markets that had lower safety requirements for block-frozen fish fillets which have lower quality and lower value per unit compared to fish fillet. After lifting the ban, the exports increased significantly from 10.8 thousand tonnes amounting to US$29 million in 1998 to almost 17.8 thousand tonnes, amounting to US$48.5 million in 2001.[157]

The latest study on Kenya fish industry has shown that the government has made substantial investment to reform the legislation and administrative structures, reinforce of

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[153] *Ibid*, pp. 46 – 47.
[154] Henson, S. & Mitullah, W., Kenyan Exports of Nile Perch: The Impact of Food Safety Standards on an Export-Oriented Supply Chain, World Bank Policy Research Working Paper 3349, June 2004, retrieved 5/10/2014, p.14. http://elibrary.worldbank.org/
[155] Ibid, p.17.
[156] *Ibid*, p.2.
[157] *Ibid*, pp. 44 – 46.

inspection and certification procedures, upgrade of laboratory facilities, and train personnel. Meanwhile, the landing-site control still needs more improvement.[158] The result of the effort is the significant increase in nominal price throughout the period of 1997 to 2001 followed by significant increase in real price by 2002.[159] The study concluded that Kenya is reactive and defensive in fulfilling safety standards and that in order to ensure continuous market access to the EU, a more proactive strategy must be adopted.

5.4. Thailand

Thailand had voluntarily implemented a HACCP fish inspection program in 1991 before it was compulsory in 1996. Under the auspices of its Department of Fisheries, all approved fish processors had implemented most of the HACCP procedure. The system successfully helped the shrimp processors to have better operations and plant management. The private sector comprised of hatcheries, nurseries, farms, feed companies, processing plants, marketers and the competent authority are well-organized and fully integrated to fulfill HACCP requirements.[160] The country also has four, well-equipped laboratories for testing bacteria, virus, antibiotics and heavy metals that carefully examine shrimp products before they are exported.[161] Most importantly, it had implemented a 'shrimp cluster' system whereas all related activities are clustered together in a particular area to maintain the smooth transition from upstream to downstream whilst reducing the transportation cost.[162]

The government had taken good steps to ensure the traceability of the shrimp products by recording information of every step of the processes within a fish plant using a 'moving document' system where the end-product ingredients are traceable to the original hatcheries. The food business operators also actively take part in controlling the production steps to ensure that the end products satisfy the set safety requirements. The systems work to convince foreign buyers on the traceability and the quality of Thai and Bangladesh shrimp exports.[163]

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[158] *Ibid*, p.75.
[159] *Ibid*, p.49.
[160] Uddin, See note 140, p. 94.
[161] *Ibid*, 104.
[162] *Ibid*, 105
[163] *Ibid*, 111

5.5. Uganda

Uganda has a large proportion of artisanal fisheries in its industry. The main problem faced by the Uganda fish industry is the health of fish stocks.[164] Despite the steady growth of its export from 1991 to 2010, the recent figure has shown a sharp decline in 2010 exports as compared to 2005. The value was US$ 143 million in 2005 and US$ 83 million in 2010.[165] Currently, Uganda has permission to export to the EU. This is the result of government and industry efforts to overcome several bans the EU has imposed between 1997 and 2000. The reform was led by the government, which had invested in training programs for official inspectors and providing new equipment for landing sites. There were also public-private investment in common chemical inspection, cold storage facilities and efforts to educate the community on hygiene practices.[166] The investment has helped ease the quality costs' burden for private sectors, especially the small-scale operators.

Overall, these five countries made their efforts in upgrading their seafood safety assurance by taking steps to ensure HACCP compliance in their fish industries. Facing the problems of traceability, Bangladesh has established check points at every step of the exports value chain coupled with a simple traceability system using farmers and region code record. As for Thailand, the idea of clustering farmers has proven to reduce the cost to implement and maintain the HACCP. Uganda also reduced the cost of HACCP by encouraging public-private investment to build needed infrastructures. Meanwhile, Kenya's approach is more reactive and defensive. Although progress has been made in legislation reform and testing facilities, a more proactive strategy is needed to achieve better progress.

India's seems to have made the most improvement in its seafood safety assurance efforts. India's fish industry reform was initially fueled by import bans from the EU and has become proactive over time. India voluntarily restricts their exports upon hazards-finding and established an advisory center at Brussels to keep up with the latest update of EU's food safety requirement and has proactively upgraded its national standards to international standards. Its government also successfully maintains a computerized tracking system to ensure seafood traceability. Most

[164] Golub, See note 23, p. 58.
[165] *Ibid*, p. 51, see figure 7 and 8.
[166] Henson, Squib & Rajasenan, See note 95, pp. 53 – 54.

importantly, the government has successfully cooperated with the private sectors to create an association to pool needed infrastructure. This pooling initiative has made small-scale operators able to integrate into the system and to stay inside the information circle.

6. CONCLUSION: RECOMMENDATIONS FOR INDONESIA

Evidence from Indonesia seafood exports to the EU has shown that the imposition of food safety regulations, notably HACCP does affect the country's performance. Estimations show that if Indonesia's fish exports were to account for the same proportion as the EU's shares of world's fish imports, it would have more than doubled the 2009 fishery products exports value. Facing this challenge, several efforts have been made. Indonesia had its seafood safety regulations catered to that of EU's standards and through the MMAF has held public training on seafood safety. The MMAF has also been actively coordinating with national customs points to improve the surveillance on seafood crossing the border. Despite the efforts made, seafood problems as recorded in the RASFF still persist. The RASFF records serve as an indication that there is still room for Indonesia fish industry to better its safety and quality assurance system.

Indonesia has a heavily disaggregated seafood supply chain that operates under a rapidly evolving regulatory environment. The market power is held by middlemen since both farmers and processors are heavily dependent on them to connect them with sufficient demand and supply of the fish. At the downstream level, the level of HACCP implementation is increasing. However, small-scale operators – particularly those at the upstream level, are not familiar with the prerequisites HACCP such as basic hygiene practice and a traceability system. This low participation of small-scale operators is a typical problem as has been found in much previous literature on the costs and benefits of HACCP. Although food safety is not the sole obligation of firms, they are indeed the principal players in determining the successful (or unsuccessful) application of quality assurance system. The key of the successful application of HACCP lies in the willingness and capacity of firms. The willingness is determined by a costs-and-benefits comparison while capacity varies from one firm to another according to its size and financial resources. The firms that are equipped with financial and human resources to implement HACCP will be able to gain long term profit. On the other hand, small operators in developing countries

suffer greater costs than their bigger counterparts. They have less resources to begin a quality management system, let alone a full HACCP plan.

Given the specific nature of hazard occurrences, the corrective actions are needed. There is no single HACCP system that can be applied to all seafood products chain in a country. Although the government might impose a regulation to require the imposition of HACCP, the result depends heavily on the operators themselves. In this context, some general suggestions that might be of use for the Indonesian government to foster the benefit of HACCP implementation are given. The suggestions are drawn from the experiences of the countries described in previous chapter which include strengthening the traceability system using computerized tracking, increasing dialogue with the EU to keep up with the latest update on food safety requirements, encouraging public-private partnership and proactively improving the domestic standards requirement.

Another aspect to examine is the facility provided by the WTO through its Standards and Trade Development Facility (STDF) whose mission is to support developing country Members in fulfilling SPS measures to gain and maintain market access. The facility has provided funding, research, technical assistance and guidelines to help developing country Members. It also pays more attention to the relation between trade facilitation and SPS measures by assisting the capacity building of governmental institutions.[167] The facility also provides economic tools to help countries analyze priority actions to ensure the implementation of SPS controls.[168] In relation to HACCP implementation in Indonesia, the economic tools provided by STDF can assist the government to pinpoint specific area of which the fish industry will need the most investment.

[167] STDF website, retrieved 28/10/2014, http://www.standardsfacility.org
[168] STDF, 'STDF Briefing No. 7: Prioritizing SPS Capacity Needs using Multi-Criteria Decision Analysis', February 2012, retrieved 28/10/2014, http://www.standardsfacility.org

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