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FACTORS INFLUENCING THE ADOPTION OF IFFO RS STANDARD BY FISHMEAL PRODUCERS:

A Case Study of Thailand

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ABSTRACT

Now that consumers in western society care more about the origins of what they eat, unsustainable practices in Thai fisheries do not only harm Thai marine ecosystem, but they also cause some trouble for downstream businesses in the fishery supply chain such as fishmeal producers that use fish to make fishmeal and sell it to animal feed mills. These fishmeal producers are accused of being part of the problems because they buy and create demand for these fish. Therefore, they are pressured by their first tier buyers – animal feed mills – which are pressured by buyers from the US and EU to have sustainable standards or guidelines to prevent fish from unsustainable sources from getting into the supply chain.

Although IFFO Responsible Supply of Fishmeal and Fish Oil Standard (IFFO RS) can be used as a tool to prevent fishmeal producers from using irresponsibly sourced raw materials, and has been introduced to Thai fishmeal producers a few years ago, the adoption of the standard among Thai fishmeal producers is extremely low despite the financial incentives given by some animal feed mills. This phenomenon is intriguing and worth studying to understand the reason why financial incentives cannot attract Thai fishmeal producers to adopt the IFFO RS standard even though much literature has shown that a price premium is one of the benefits that encourage producers to adopt voluntary standards.

Thus, this study aims to identify the factors that influence Thai fishmeal producers to, or not to, adopt the standard by achieving two objectives: 1) identify drivers, barriers, and perception of Thai fishmeal producers that affect the adoption of IFFO RS standard, and 2) understand how other stakeholders in the fishmeal supply chain affect the adoption of IFFO RS standard by Thai fishmeal producers. This study uses a case study approach to capture the complexity of the case in Thailand. The author divides the case into two parts based on the objectives. The key issues in the first part are drivers, barriers, and perception related to the standard adoption while the key issues in the part II are requirements of the IFFO RS standard, perception of other stakeholders regarding the standard adoption, and bargaining power in the supply chain. Methods used in this study include data-content analysis and semi-structured, in-depth interviews with fishmeal producers and other stakeholders. In the first part, the author interviews 16 fishmeal producers at nine provinces in Thailand while in the

second part, two animal feed mills, one broker, one NGO, and one government agency were interviewed

The results from part I show that that the drivers of the IFFO RS standard adoption are 1) the owners' or managers' positive perceptions of the standard, 2) customer demands, 3) a price premium, and 4) brand image. And there are six barriers to the adoption namely 1) type of main raw materials, 2) the owners' or managers' negative perceptions of the standard, 3) the owners' or managers' lack of knowledge about the standard, 4) size of fishmeal producers, 5) lack of support from the government, and 6) administrative incapacity. However, the author concludes that the type of main raw materials that the fishmeal producers use is the most influential factor that prevents many of them from adopting the IFFO RS standard. This is because without raw materials from sources compliant to the standard, fishmeal producers cannot produce IFFO RS approved fishmeal. And no Thai fisheries comply with the IFFO RS standard, so fish from these sources are not certifiable.

The results from part II show that factors affecting the IFFO RS standard adoption exist beyond business operations. The IFFO RS Standard needs collaboration from suppliers, buyers and the government while most of these other stakeholders who were interviewed perceive that the IFFO RS standard is unnecessary or not suitable for fishmeal producers in Thailand. Therefore, when we look at the demands for the IFFO RS standard, it is limited to only fishmeal producers supplying their products to animal feed mills which sell their products to farms aiming to export their products to the EU and US markets. In turn, fishmeal producers supplying to brokers or animal feed mills that have final customers in non-EU&US markets are not demanded by their direct customers for the IFFO RS standard adoption.

This results make us understand why only two fishmeal producers adopted the IFFO RS standard at that time, and why other fishmeal producers did not adopt the standard despite the price premium offered to them. This is because on the supply side, compliant raw materials are limited, whereas on the demand side, no demand from customers except from one animal feed mill which has final customers in the EU and US markets. Hence, solely providing financial incentives such as a price premium to Thai fishmeal producers is insufficient to encourage them to adopt the IFFO RS standard. Helping the producers overcome this barrier is more critical than providing incentives. This means that the Thai government has to manage and conserve Thai fisheries more efficiently and transparently, and emphasizes the environmental responsibility of all stakeholders in order to prevent

overfishing and IUU fisheries. Also, as we learn that factors affecting the IFFO RS standard adoption exist beyond business operations, and collaboration among various stakeholders is necessary for the adoption of the standard. Besides, to encourage the IFFO RS standard adoption, benefits of all the stakeholders should be considered.

Keywords: fishmeal producer, IFFO RS, third-party standard, standard adoption, Thailand

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

Fishmeal is brown powder made from cooked, and grounded fish – usually short-lived, fast-growing ones – and fish by-products from seafood processing firms (What are marine ingredients?, n.d.). It is an important ingredient for animal feed, especially shrimp and fish feed, because it provides high nutritional protein to farm animals (Miles & Chapman, 2005). Over 50 years ago, fishmeal was mainly used in poultry and livestock feeds (IFFO, 2009). But because the aquaculture industry has been growing very fast since 1980, the aquaculture industry has become the major user of fishmeal. This is reflected in the changes in fishmeal usage (World Bank, 2013) as shown in Figure 1.

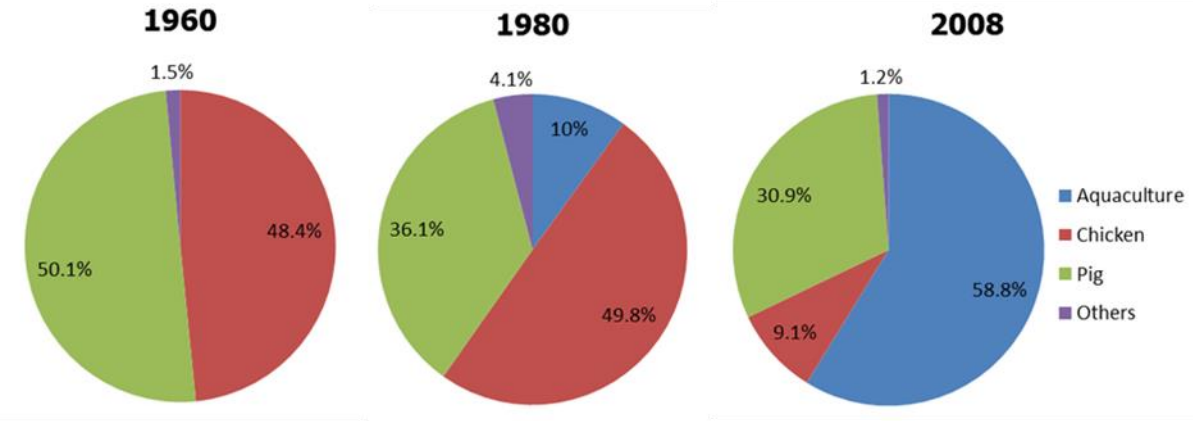

Figure 1 Changes in the usage of fishmeal in animal feeds. Adapted from International Fishmeal and Fish Oil Organisation 50th Anniversary by IFFO, 2009.

According to a World Bank report "Fish to 2030 Prospects for Fisheries and Aquaculture, by 2030", 62% of seafood that people eat will come from aquaculture. Because

the global aquaculture industry has been booming and expanding, demands for fishmeal in the future will increase even more (World Bank, 2013)

Thailand was the fourth largest fishmeal producer producing 381,200 tons of fishmeal in 2009 (IFFO, 2010 cited in Seafish, 2011). The production remained around 500,000 tons for many years before dropping to below 400,000 tons (Akaravarinechai, 2012; TFPA, Fishmeal Production from B.E. 2553 – 2558, 2016 via personal communication). The demand for fishmeal mostly comes from the aquaculture sector (Thai Feed Mill Association, 2010). Thailand has a large farmed shrimp industry. In 2014, Thailand was the world's fourth largest shrimp exporting country with shrimp exports amounting more than 167,000 tons (FAO, 2015), accounting for around 1.86 billion USD (Sethteethorn, 2015) (More information about Thai fishmeal industry will be discussed in the background section).

However, in the past few years, Thai fishmeal industry has unexpectedly gained some attention from media and NGOs, especially those from the U.S., when The Guardian published the results of an investigation on the supply chain of prawns in Thailand. It found that Charoen Pokphand Foods (CPF) – a Thai seafood supplier and the world's largest prawn farmer – bought fishmeal from some suppliers who bought fish from fishing boats that used slave labor. CPF used the fishmeal to feed CPF's farmed prawns (Trafficked into slavery, 2014).

Shortly after that, Carrefour, a French retailer and one of the world's largest retailers, decided to stop purchasing shrimps from CPF until it could rectify this issue (Carrefour stops buying, 2014). Later, three law firms in California filed a class action lawsuit against CostCo and CPF for selling prawns from a supply chain involving slavery unless they put a label on the product saying "the produce of slavery" (Costco and CP, 2015, para. 3). The firms alleged that CostCo has sold farmed prawns from CP Foods and other suppliers that "have sourced

the raw material for their feed from ships manned by slaves" (Costco and CP Foods face lawsuit over alleged slavery in prawn supply chain, 2015, para. 3).

Not only has CPF been affected by the Guardian's investigation, Thailand itself was downgraded from a Tier 2 Watch List to a Tier 3 ranking on the 2014 Trafficking in Persons (TiP) Report by the US State Department on June 20th, 2014 – 10 days after the investigation (Thailand downgraded to Tier 3 on US TIP report, 2014), causing a lot of concerns that it would affect the export sector, particularly seafood export, and damage the image of Thailand (ASTV Manager Online, 2014). And in 2015, the country still remained at a Tier 3 ranking on the 2015 TiP Report as the government did not take sufficient measures to improve the situation (Parpart & Pratruangkrai, 2015).

However, the nightmare of Thailand's fishery industry did not ended there. Early 2015, Thailand just got a Yellow card – a warning – from the European Commission (EC) for failing to put enough effort to monitor, control, and sanction the Illegal, Unreported, and Unregulated Fishing (IUU) (European Commission, 2015). And this became an urgent agenda of Thai military government because if Thailand could not solve the IUU problem, it might get a Red card from the EC, and it would lead to a trade ban which will cost the fishery industry as much as 500 million USD (Prachachart Online, 2015).

These incidents are examples of problems existing in the fishery industry in Thailand, and their consequences. They subsequently affect Thai fishmeal industry greatly because CPF - one of its largest buyers which bought 40-50% of fishmeal production in the country (Prachachart Online, 2014) - became very strict regarding its purchasing criteria and announced that it will only purchase IFFO RS approved fishmeal. CPF stated that it was pressured by international clients. This means that all of its suppliers but one could no longer sell their products to CPF. CPF tried to encourage fishmeal producers to adopt the IFFO RS standard by increasing fishmeal prices three times and by inviting some fishmeal producers to

adopt the standard under chain of custody of CPF (Thai Fishmeal Producers Association, 2015). However, despite the financial incentive offered by the firm, only two fishmeal producers adopted the standard when this study started before increasing to five after this study has progressed (as of June 10, 2017) (IFFO, IFFO RS Certified Plants, n.d.). Therefore, the questions are "why did only two fishmeal producers adopt the IFFO RS standard at that time?" and "why do other fishmeal producers not adopt the standard despite the price premium offered to them?"

1.2 Research Gap

Until now, the literature that directly discusses about fishmeal supply chain in Thailand includes 1) Economics of Fishmeal Production and Market in Upper South Region in 2007 by 8th Regional Office of Agricultural Economics, Bureau of Agricultural Economics Research, MOAC, in 2008, 2) A Study of Economics of Fishmeal Production and Market under the Quality Assurance System by Bureau of Agricultural Economics Research, MOAC in 2012, and 3) Mapping Shrimp Feed Supply Chain in Songkhla Province to Facilitate Feed Dialogue by Achavanuntakul, et al. in 2014. The first two mainly explain Thai fishmeal producers' operations and supply chain in different regions, whereas the last one focuses on the fishmeal supply chain in Songkhla provinces, and it also touches upon problems in the fishmeal supply chain as well as standards including the IFFO RS. Even IFFO RS can be utilized a tool improve the fishmeal supply chain, none of these reports discuss about the IFFO RS standard adoption as a means to promote the sustainable fishmeal supply chain in Thailand – not to mention about how to influence fishmeal producers to adopt the standard.

As for other literature about third-party voluntary certificate standards, they mainly discuss about Forest Stewardship Council (FSC) and Marine Stewardship Council (MSC)

(Fischer, Aguilar, Jawahar, & Sedjo, 2005; Gale & Haward, 2004; Goyert, Sagarin, & Annala, 2010; Perez-Ramirez, Lluch-Cota, & Lasta, MSC certification in Argentina: Stakeholders' perceptions and lessons learned, 2012b; Ponte, 2006) which are well-known voluntary, sustainability standards for forestry industry and fishery industry. There is barely any academic, peer-review literature talking about the IFFO RS standard. Although IFFO RS, FSC, and MSC are voluntary standards, the nature of the industries are different. While consumers will FSC and MSC logos on the certified products, consumers who buy shrimps fed by shrimp feed containing the IFFO RS approved fishmeal will not see the logo of IFFO RS on the packages of their shrimps. This is because fishmeal businesses are purely business-to-business (B2B); they sell their products to animal feed mills, farms and brokers – none to consumer. But for fishery businesses, they are both B2B and B2C. Thus, there might be some differences between factors that trigger B2B firms and B2C companies to adopt a voluntary sustainability standard.

As for the literature about fishmeal, they discuss about the nutrients or chemical properties of fishmeal (Forster, Campbell, Morton, Hicks, & Rowshandeli, 2017; Luo, Liang, & Shen, 2016; Miles & Chapman, 2005; Sydenham, Truong, Moss, Sells, & Liu, 2017; Yamamoto, et al., 2016), or operations of fishmeal businesses (Cheng, et al., 2016; Corten, Braham, & Sadegh, 2017; Freon, Durand, Avadi, Huaranca, & Moreyra, 2017; Kaliba, Engle, & Bouras, 2010; Likitrattanaporn, 2016). They do not focus on improving the fishmeal supply chain through the IFFO RS standard adoption while this study presents a case study about factors that influence fishmeal producers to adopt the IFFO RS standard which has rarely, if not never, seen before.

1.3 Research Objectives and Structure

From the aforementioned problem statement and research gap, this study aims to investigate the case further in order to understand why many Thai fishmeal producers do not adopt the IFFO RS standard despite the price premium offered to them. Hopefully, the results will help related policy makers understand the causes of the non-adoption among Thai fishmeal producers and be able to create a policy that will encourage more adoption which eventually leads to better and more sustainable practices in the fishmeal supply chain in Thailand. To achieve, this study has two objectives:

1) To identify drivers, barriers, and perception of Thai fishmeal producers that affect the adoption of IFFO RS standard
2) To understand how other stakeholders in the fishmeal supply chain affect the adoption of IFFO RS standard by Thai fishmeal producers

With these objectives, this study consists of two part based on the objectives. The first part focuses on Thai fishmeal producers trying to understand the problem from the point of view of them, whereas the second part aims to understand how other stakeholders in the supply chain such as buyers or suppliers can affect Thai fishmeal producers' decision.

The structure of this thesis starts with the introduction to the research in chapter 1 followed by background information about Thai fishmeal industry, history of fishmeal industry and the IFFO RS standard in chapter. The next chapter is the literature reviews on theories and concepts used in this research, and then the methodology is explained in chapter 4. The subsequent chapter is results followed by chapter 6 – discussion. The thesis ends with chapter 7 – conclusion and policy recommendations.

CHAPTER 2

BACKGROUND

2.1 Overview of Fishmeal Industry in Thailand

Fishmeal industry in Thailand is part of billion USD aquaculture supply chain. In 2014, Thailand is the fourth world's largest shrimp exporting country with the shrimp exporting amount around 167,057 tons (FAO GLOBEFISH, 2015), accounting for around 2.17 billion USD (1 USD = 30 THB) (Sethteethorn, 2015). Apart from a large aquaculture industry, Thailand also has a big fishmeal industry. In 2009, Thailand was the fourth largest fishmeal producer and consumer producing 381,200 tons of fishmeal and consuming 409,000 tons as shown in Table 1 and 2 (IFFO, 2010 cited in Seafish, 2011).

Table 1 Fishmeal production by global top five fishmeal production countries from 2001 – 2009 (thousand tons)

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009
Peru	1,844	1,941	1,251	1,982.7	2,019.9	1,378	1,407	1,430.3	1,346.9
Chile	699	839	664	933.1	870.4	854.7	781.9	729.7	641
Thailand	381	387	397	403	473.4	461.2	428	468	381.2
USA	342	337	318	353	268.8	232	251	216.2	249
Japan	227	225	230	295	221.9	219.6	210	202.9	192

Source: Adapted from IFFO Fishmeal and Fish Oil Statistical Yearbook 2010 cited in Seafish (2011).
Note: No revision has been made to the figures.

Table 2 Fishmeal consumption by global top five fishmeal consumption countries from 1996 – 2004 (thousand tons)

Country	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
China	1,240	1,516	1,113	1,366	2,030	1,682	1,406	1,183	1,528
Japan	802	792	699	744	710	691	687	596	703
Chile	293	261	149	351	270	222	351	36	467
Thailand	566	466	418	481	504	484	408	405	409
Norway	232	320	247	223	361	276	246	289	309

Source: Adapted from IFFO Fishmeal and Fish Oil Statistical Yearbook 2005 cited in Seafish (2011).
Note: No revision has been made. Figure of Chile in 2003 is believed to be a typo.

2.1.1 Thailand's fishmeal production

2.1.1.1 Total number of fishmeal production

Thailand's annual fishmeal production had remained about 420,000 – 500,000 tons at least for a decade (see Figure 2) until 2015 when the annual production drastically dropped to around 380,000 tons or about 20% from the total production of the previous year (2014) mainly due to the strict law enforcement by Thai military government on IUU fishing which prohibits illegal fishing boats from operating. It was estimated that 4,000 -5,000 trawlers have no other choice but stop operating causing the shortage of raw materials for fishmeal producers (discussed more in details in the next section) (IUU Causing Fishmeal and Fish Sauce Producers Raw Materials Shortage, 2015). Also, another reason is that since early 2015, the Indonesian government did not renew fishing permission in the Indonesian waters (Office of Agriculture Economics, 2015) as well as adopted harsh measures against illegal fishing boats that trespass and poach in the Indonesian waters (Tamindael, 2015).

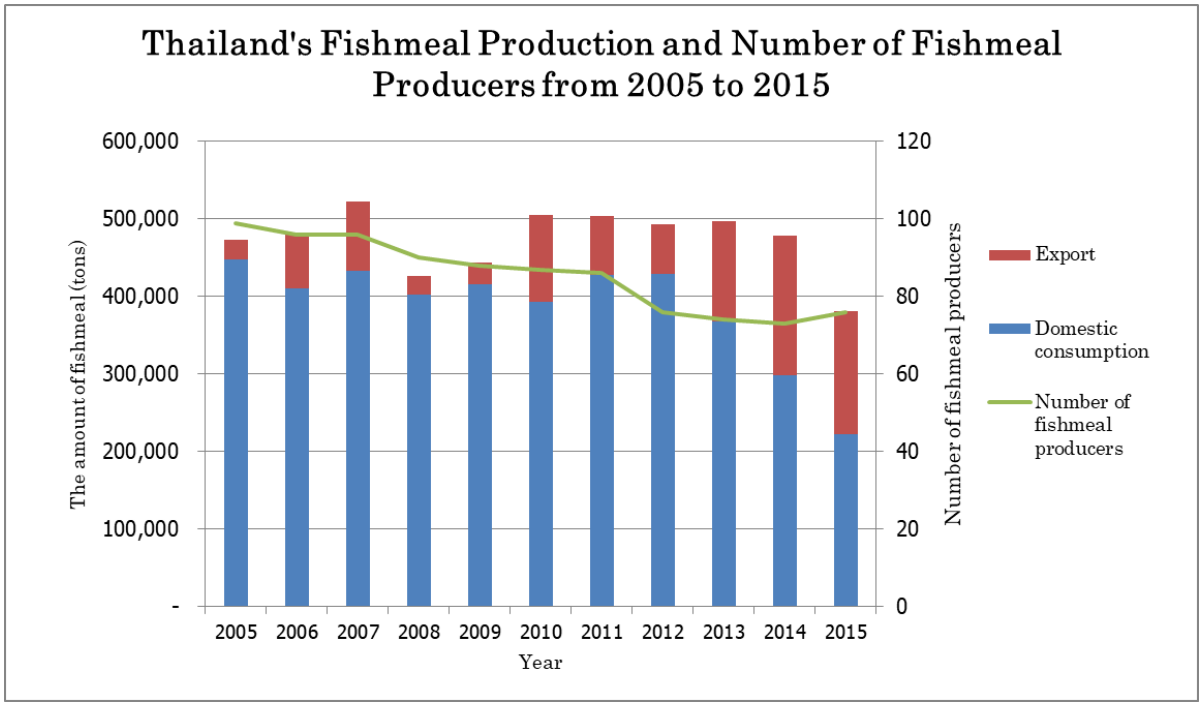

Figure 2 Thai fishmeal production and the number of Thai fishmeal producers from 2005 to 2015. Adapted from Presentation at Rama Garden Hotel by Akaravarinechai, 2012, Retrieved April 8, 2016, from http://www.thaichamber.org/userfiles/file/6(1).pdf; and *Fishmeal Production from B.E. 2553 – 2558*, by TFPA, 2016, via personal communication; and *Fisheries Statistics of Thailand B.E. 2548 - 2557*, by Fishery Statistics Analysis and Research Group, Fishery Information Technology Center, the Department of Fisheries, 2005 -2014, Retrieved April 8, 2016, from http://www.fisheries.go.th/it-stat/; and *List of fishmeal producers certified and not certified by GMP and HACCP*, by TFPA, 2015, via personal communication.

Note. [1] Domestic consumption numbers come from the assumption that the total fishmeal production deducted by the number of fishmeal exports in each will equal the number of domestic consumption of fishmeal produced domestically. [2] The numbers of fishmeal producers shown in line graph in Figure 1 come from two sources of information. From 2005 – 2014, the numbers come from *Fisheries Statistics of Thailand 2005 - 2014*,by Fishery Statistics Analysis and Research Group, Fishery Information Technology Center, the Department of Fisheries, 2005 –2014, and the number in 2015 comes from *List of fishmeal producers certified and not certified by GMP and HACCP*, by TFPA, 2015.

However, please note that the numbers of fishmeal production in Figure 2 come from TFPA which shows different numbers of fishmeal production from those of the statistics of the Department of Fisheries (DoF) (see Figure 3). If we compare the numbers from the two organizations, we will see that the numbers from the DoF statistics are around 100,000 tons lower than those of TPFA. One reason of this discrepancy could be that fishmeal producers might be afraid to pay more tax, so they have given smaller numbers than their actual productions; however this is just one assumption. In this research, the author mainly uses the numbers from TFPA because they are usually, if not always, used as reference numbers in many public information such as news.

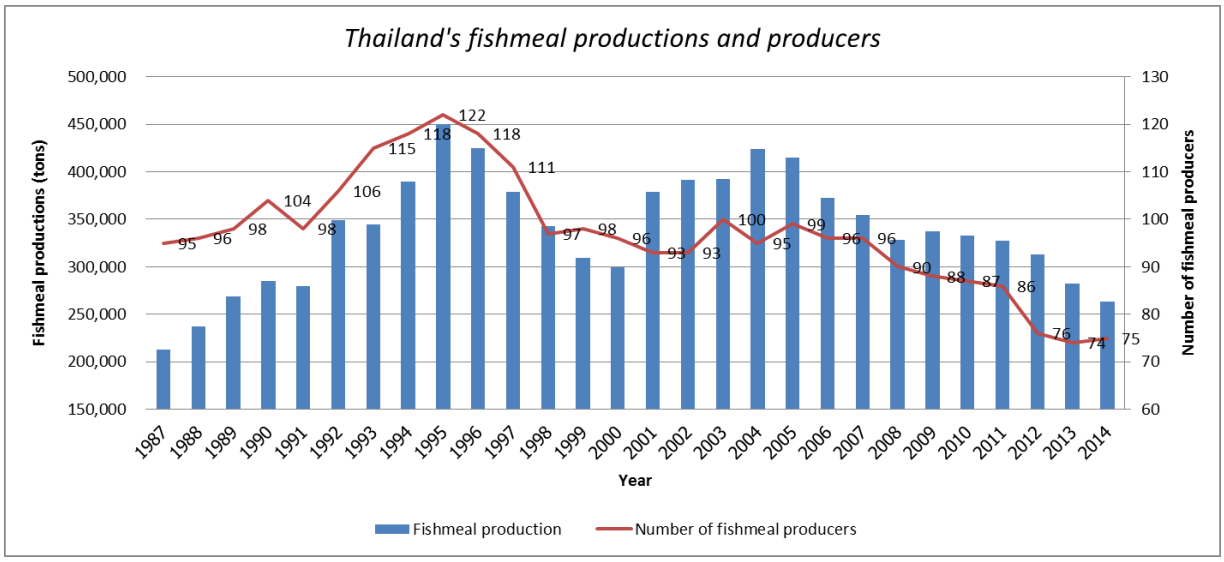

Figure 3 Thai fishmeal production and the number of Thai fishmeal producers from 1987 to 2014. Adapted from *Fisheries Statistics of Thailand B.E. 2530 - 2557*, by Fishery Statistics Analysis and Research Group, Fishery Information Technology Center, the Department of Fisheries, 1987 -2014, Retrieved April 8, 2016, from http://www.fisheries.go.th/it-stat/

2.1.1.2 Locations of fishmeal producers

In Thailand, fishmeal producers are located in the provinces connecting to the sea (Akaravarinechai, Factors influencing fishmeal producers to adopt IFFO RS, 2016)– the Gulf of Thailand (GoT) and Andaman Sea. Currently, there are only 16 fishmeal producing provinces (see Figure 4), and in 2015, the five largest fishmeal producing provinces are 1) Samut Sakhon (109,957 tons) 2) Phuket (35,277 tons) 3) Samut Prakan (33,629 tons) 4) Songkhla (29,403 tons) and 5) Nakhon Si Thammarat (29,165 tons) (Thai Fishmeal Producers Association, 2016).

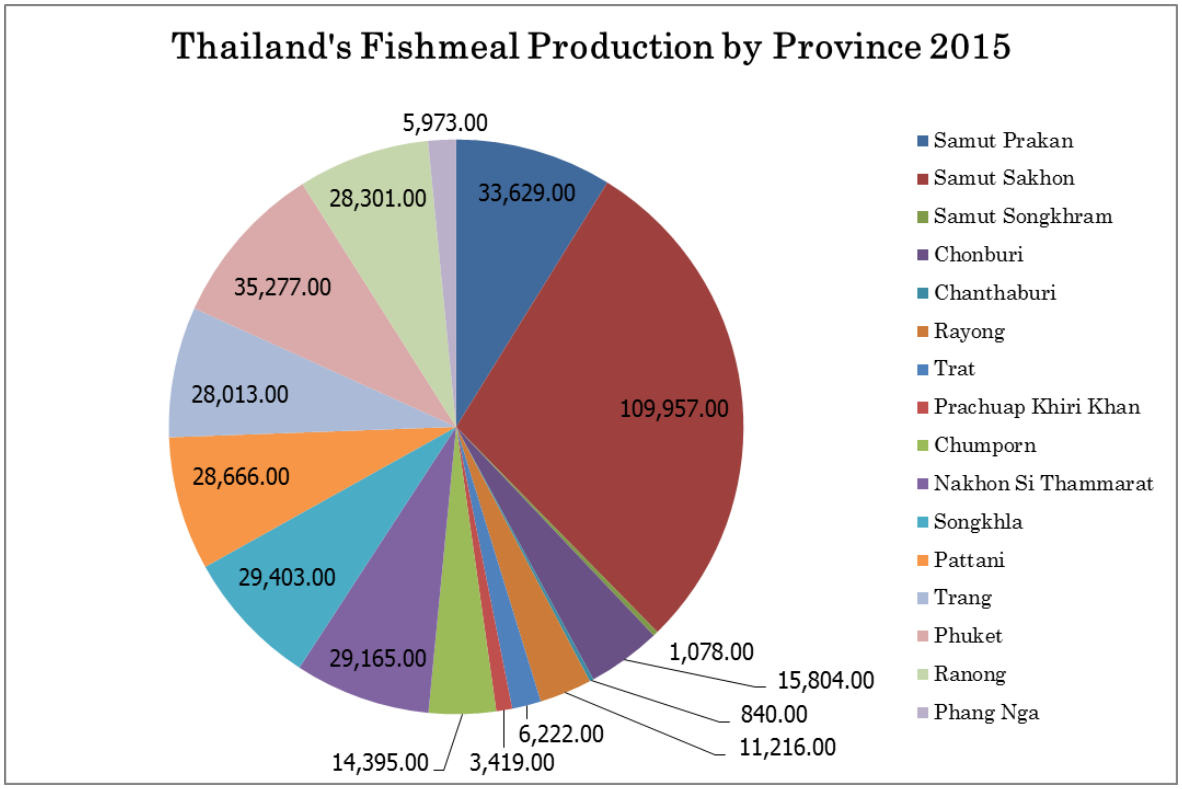

Figure 4 Thailand's Fishmeal Production by Province 2015. Adapted from *Fishmeal Production from B.E. 2553 – 2558*, by TFPA, 2016, via personal communication.

From Figure 2, we can see that the number of fishmeal producer has decreased to fewer than 80 since 2012 (currently around 71). However, according to the in-depth interview with Mr. Sagnuansak Akaravarinechai – the President of TFPA, it is difficult to tell how many fishmeal producers actually operate because what usually happens is that if they do not have raw materials enough to run their operations, they will just close their fishmeal factories and move their workers to do something since the owners of fishmeal producers usually have other fishery-related businesses as well, and when they got enough raw materials, they move their workers back to the fishmeal factories, so that is why it is hard to identify the actual number of fishmeal producers (Akaravarinechai, Factors influencing fishmeal producers to adopt IFFO RS, 2016).

2.1.1.3 Raw materials

Raw materials of fishmeal production can be divided into two groups: 1) whole fish[1], and 2) trimmings or sometimes called by-products which are heads, bones, or offal of fish from fish processor plants (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012; Achavanuntakul, et al., 2014) (see Figure 5 – 8). The global ratio of raw materials of fishmeal is 75% whole fish and 25% trimmings (Shepherd & Jackson, 2012). However, in Thailand, based on TFPA, the ratio is 65% trimmings and 35% whole fish (see Figure 9) (Achavanuntakul, et al., 2014), and based on the statistics of the DoF, the ratio is similar – around 39% whole fish and 61% trimmings (see Figure 10)(Fishery Statistics Analysis and Research Group, Department of Fisheries, Ministry of Agriculture and Co-operatives of Thailand, 2013). Nonetheless, even though the ratios of whole fish to trimmings from the two organizations are similar, the numbers of total raw materials are significantly different – around 0.8 – 1 million tons. From Figure 10, it is obvious that after 1997, trimmings have replaced large amount of trash fish while trash fish have been experiencing a downward trend since then.

[1] Whole fish or in Thai 'Pla Rue' literally means 'fish from fishing boats' in contrast to trimmings which are also called 'Pla Rong-Ngan' or 'factory fish' – off-cuts of fish that came from fish processing factories. Whole fish include trash fish which by the definition of FAO is by-catch that has low economic values and people do not eat even they are in good conditions; however, in Thailand, trash fish usually refer to both damaged, spoiled fish due to poor post-catch handling, and crushed fish and crustaceans captured by trawlers (Achavanuntakul, et al., 2014)

Figure 5 Mashed-up fish classified as trash fish (whole fish). These are typical trash fish captured by trawlers in Thailand. (Image by the author)

Figure 6 Collection of spoiled, damaged fish classified as trash fish (whole fish). Brokers will collect this type of trash fish and sell them to a fishmeal producer. (Image by the author)

Figure 7 Cut fish heads classified as trimmings. These are typical by-products from Surimi producers which use only fish flesh. Local fish processors at the port called *"Lhong"* will prepare the fish by cutting the heads, separate them in baskets, send the bodies to Surimi producers, and off-cuts to fishmeal producers. (Image by the author)

Figure 8 Cooked heads bones and tails of tuna and fresh offal (red part) classified as trimmings. They are by-products from a tuna canning factory. (Image by the author)

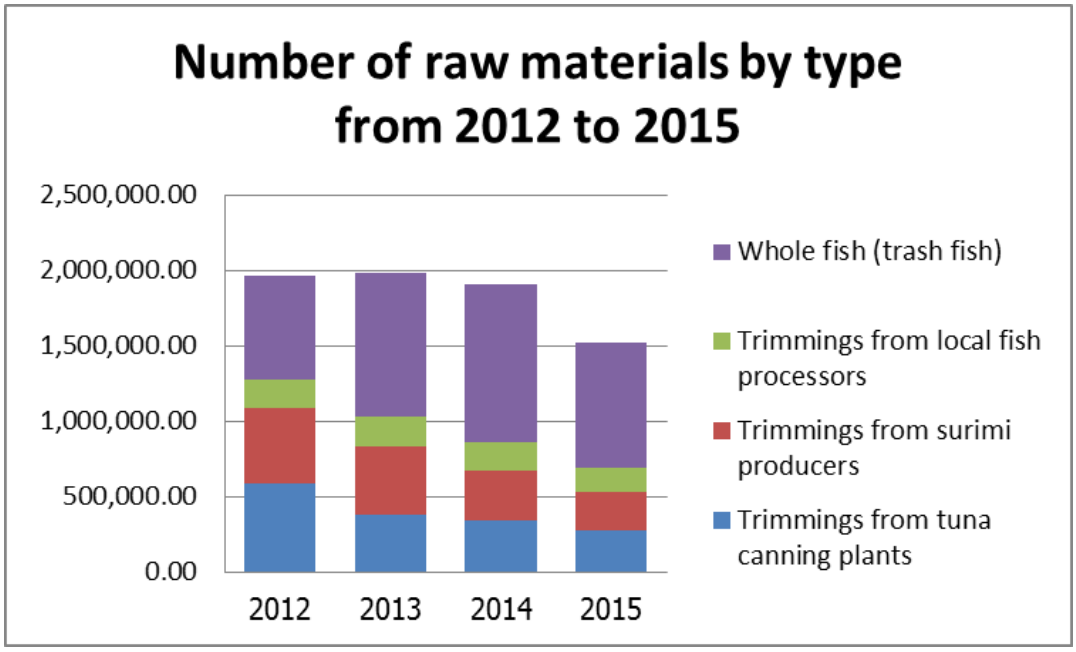

Figure 9 Number of raw materials by type from 2012 to 2015. Adapted from *the amount of raw materials used in fishmeal production B.E. 2555 – 2558*, by TFPA, 2013 and 2016, via personal communication.

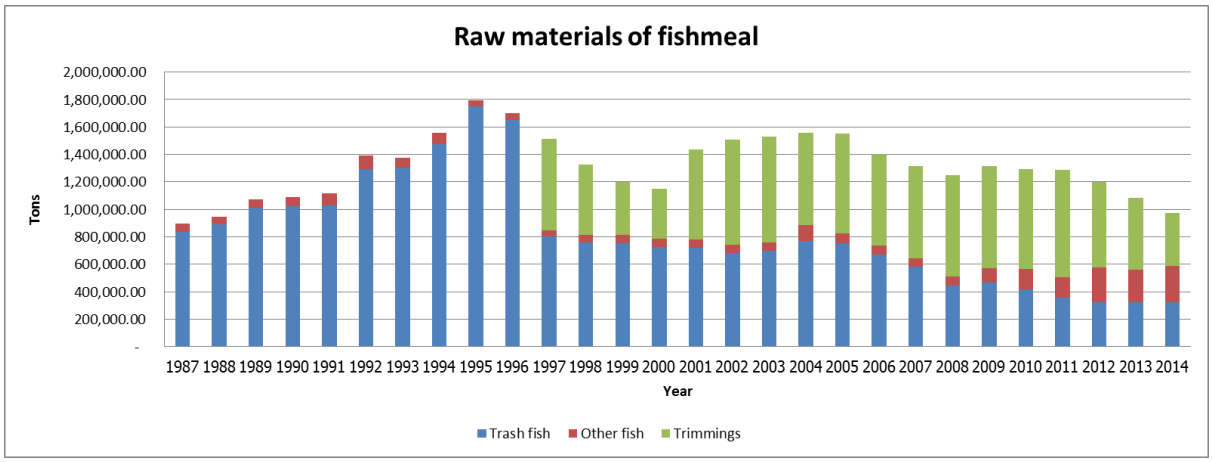

Figure 10 Number of raw materials by type from 1987 to 2014. Adapted from *Fisheries Statistics of Thailand B.E. 2530 - 2557*, by Fishery Statistics Analysis and Research Group, Fishery Information Technology Center, the Department of Fisheries, 1987 -2014, Retrieved April 8, 2016, from http://www.fisheries.go.th/it-stat/

2.1.1.4 Grades of fishmeal

Fishmeal is a commodity that has a standard. According to Notification of Ministry of Commerce Re: Prescribing Fishmeal as a Standardized Commodity and the Standards of Fishmeal, fishmeal is divided into three grades of quality: 1st grade, 2nd grade, and 3th grade (Notification of Ministry of Commerce Re: Prescribing Fishmeal as a Standardized

Commodity and the Standards of Fishmeal, 1985) which is similar to the Notification of MOAC that also classifies fishmeal into three groups of quality (see Table 3) (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012).

Table 3 Grades of fishmeal quality and their composition

Composition	1st Grade	2nd Grade	3rd Grade
Protein (not less than)	60%	55%	50%
Ash (not more than)	26%	28%	30%
Salt (not more than)	3%	3%	3%
Humidity (not more than)	10%	10%	10%
Remaining (not less than)	2%	2%	2%

Source: Adapted from Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC) (2012)

The above grades of fishmeal quality are specified by the government agencies; however, in the fishmeal industry, the quality of fishmeal is classified basically into five grades: shrimp grade, 1st grade, 2nd grade, 3rd grade, and fish head grade, and 1st – 3rd grades are divided further into upper and lower grades (Thai Fishmeal Producers Association, 2016). The classification is mainly based on the percentage of protein content of fishmeal and other criteria including odor, Total Volatile Basic Nitrogen (TVBN – indicator of freshness), and the percentage of humidity (Achavanuntakul, et al., 2014)

According to TFPA, in 2015, of total fishmeal production, 45% (171,611.1 tons) was fishmeal with protein content from 60% and above, 35% (133,475.3 tons) fishmeal with protein content between 55%-59.9%, 15% (57,203.7 tons) fishmeal with protein content between 50%-54.9%, and only 5% (19,067.9 tons) fishmeal with protein content between 40%-49.9% (see Figure 11) (Thai Fishmeal Producers Association, 2016). This has increased from the number in 2009 that stated that fishmeal with protein content from 60% and above

accounted only 25% of the total fishmeal production (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012).

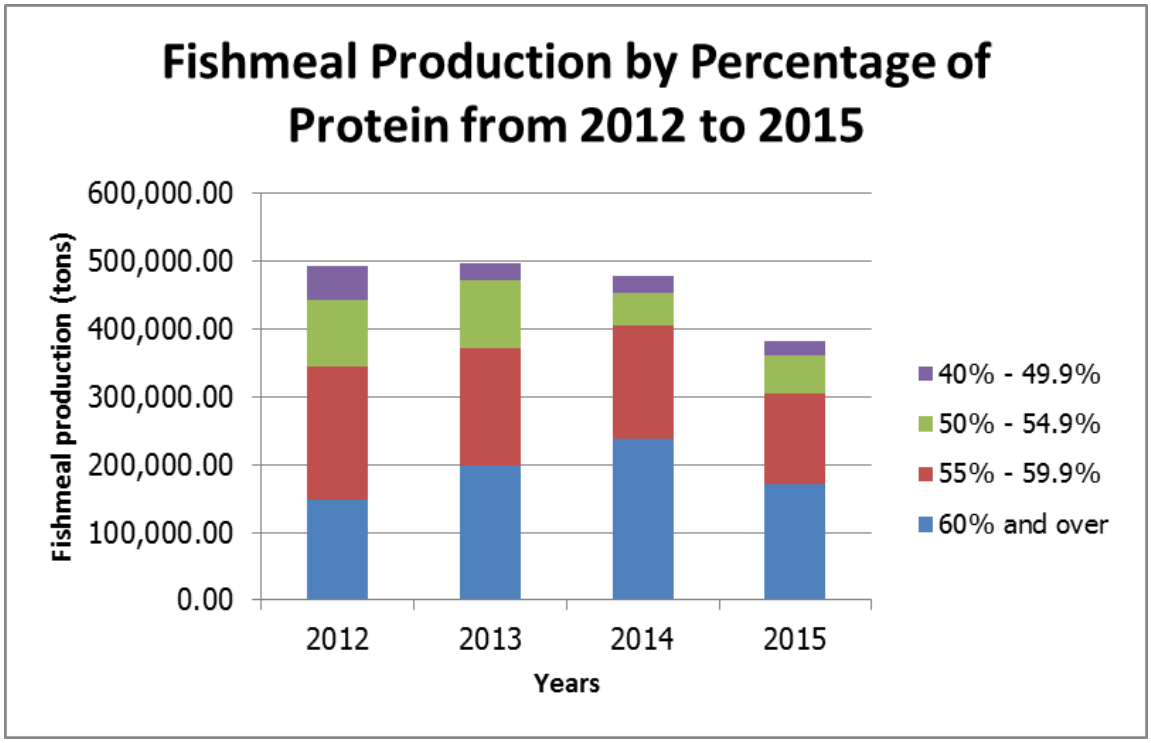

Figure 11 Fishmeal production by percentage of protein from 2012 to 2015. 2012 to 2015. Adapted from *the amount of raw materials used in fishmeal production B.E. 2555 – 2558*, by TFPA, 2013 and 2016, via personal communication.

2.1.1.5 Prices of fishmeal

Globally, fishmeal price has experienced an upward trend (see Figure 12) because there is a high demand for fishmeal in the aquaculture industry, mainly from China which is the world's largest fishmeal consuming country, and low supply caused by El Nino phenomenon and declining fishery resources (Globefish, 2009 – 2013 and Mavromichalis, 2013 cited in Achavanuntakul, et al., 2014).

Figure 12 Peruvian fishmeal price from 1980 to 2016, by International Monetary Fund, 1980 – 2016, Retrieved April 15, 2016, from https://ycharts.com/indicators/peru_fish_meal_price/chart/#/?securities=include:,id:I:PFMP,,&calcs=&correlations=&zoom=&startDate=&endDate=&format=real&recessions=false&chartView=&splitType=single&scaleType=linear&securitylistName=&securitylistSecurityId=&securityGroup=

In Thailand, from the past until 2015, the prices of fishmeal used in the industry were referred from the prices announced by Bangkok Produce Merchandising Public Co. Ltd. (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012), which is a subsidiary of CPF and supplies the ingredients of animal feeds to CPF that was once the largest fishmeal buyer purchasing about 40 to 50% of the fishmeal production (Prachachart Online, 2014). Fishmeal prices are determined by 1) demands for fishmeal 2) supply of fishmeal 3) supply and price of substitute products such as soybean meal, and 4) prices of imported fishmeal (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012). Figure 13 is the graph of average prices of domestic and imported fishmeal. It is obvious that the average price of imported fishmeal has approximately doubled that of locally produced fishmeal, and when we compare the two graphs, both have upward trends, but imported fishmeal seems have to higher increases.

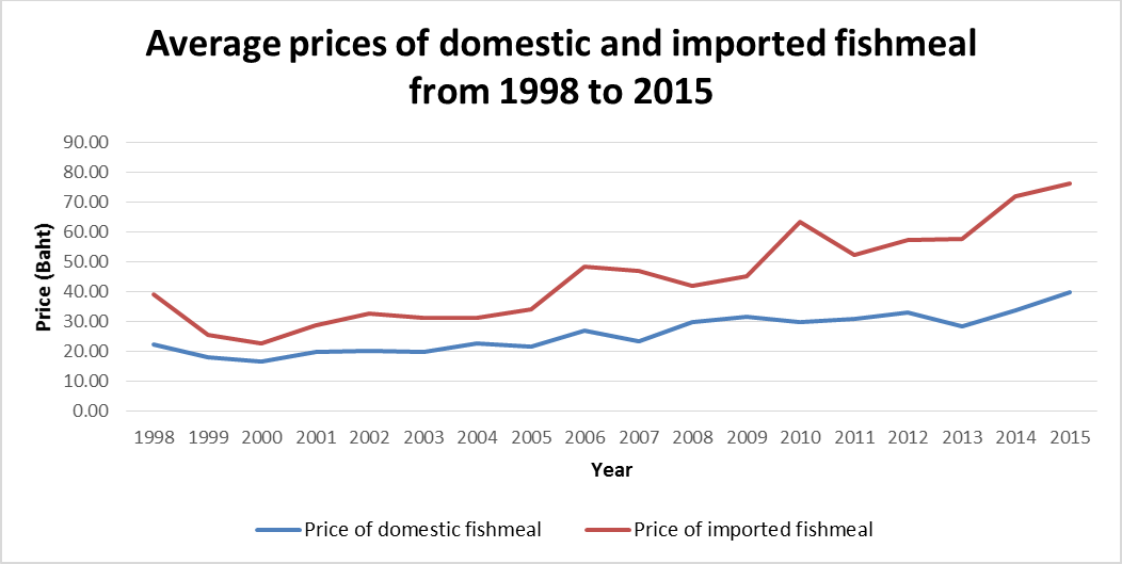

Figure 13 Average prices of domestic and imported fishmeal from 1998 to 2015. Adapted from *Monthly Price Update on Fishmeal and Imported Fishmeal*, by Thai Feed Mill Association, 2016, Retrieved April 15, 2016, from http://www.thaifeedmill.com/tabid/78/Default.aspx

After September 2015 when CPF stopped buying non-IFFO RS approved fishmeal, TFPA started to publish recommended prices of fishmeal (see Table 4) on its website (thaifishmeal.com) for its members to use as reference prices (Akaravarinechai, Factors influencing fishmeal producers to adopt IFFO RS, 2016)

Table 4 Fishmeal prices recommended by Thai Fishmeal Producers Association on April 13, 2016.

Grade of Fishmeal	Price on 13 April 2016 (baht/kg.)
Shrimp grade protein 65%-99.99% TVBN < 120	41.00
1st grade protein 60%-99.99% TVBN < 130	38.00
1st grade protein 57%-59.99% TVBN < 130	36.00
2nd grade protein 60%-99.99% TVBN < 150	33.00
2nd grade protein 54%-59.99% TVBN < 150	31.00
3rd grade protein 60%-99.99% TVBN < 180	27.00
3rd grade protein 52%-59.99% TVBN < 180	26.00
Fish head grade 45%-54.99% TVBN < 120	28.00

Source: Adapted from Thai Fishmeal Producers Association (2016)

2.1.2 Thailand's fishmeal consumption

2.1.2.1 Total number of fishmeal consumption

When we add up the numbers of fishmeal left from the exports (as shown in Figure 1) to the amount of imported fishmeal, we will get the numbers of the domestic consumption of fishmeal in Thailand (see Figure 14) which have been around 400,000 to 450,000 tons for many years before it began to decline to around 370,000 tons in 2013 and subsequently to only around 250,000 tons in 2015. This is partly because lower demands on shrimp feeds due to the fact that Thailand's shrimp farms were attacked by Early Mortality Syndrome (EMS) during the end of 2012 (Office of Agricultural Economics, 2013)

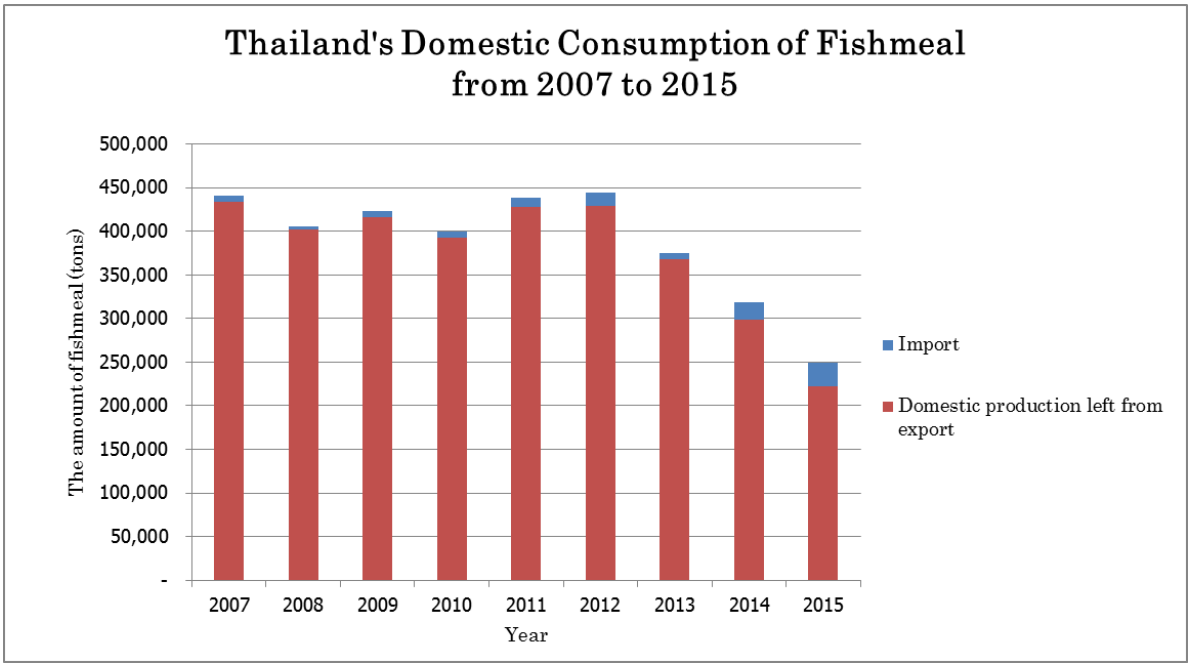

Figure 14 Thailand's domestic consumption of fishmeal from 2007 to 2015. Adapted from *Report of the amount and values of Thailand's imported fishery products from B.E. 2550 – 2559 (2007-2016)* by International Fish Trade Analysis Group, Fisheries Foreign Affairs Division, Department of Fisheries, Retrieved April 10, 2016 from http://www.fisheries.go.th/foreign/fisher2/index.php?option=com_goods& view=imports&layout=search&Itemid=140 ; and Presentation at Rama Garden Hotel by Akaravarinechai, 2012, Retrieved April 8, 2016, from http://www.thaichamber.org/userfiles/file/6(1).pdf; and *Fishmeal Production from B.E. 2553 – 2558*, by TFPA, 2016, via personal communication.

2.1.2.2 Fishmeal consumption trend

Apart from growing number of exported fishmeal since 2013, this downward trend of domestic consumption of fishmeal can also be explained by the advance of R&D in feed production technology that allows proteins from plants such as soybean meal to replace proteins from animals like fishmeal in feeds for many species of animals such as pigs and chicken (Akaravarinechai, Factors influencing fishmeal producers to adopt IFFO RS, 2016). This shares the same trend as the global fishmeal industry. According to IFFO, in the past, fishmeal was mostly used in feed production for chickens and pigs; however, the trend has changed in recent years with an increasing proportion of feeds for aquaculture.

2.1.2.3 Thailand's major fishmeal buyers

The major buyer and user of fishmeal in Thailand used to be animal feed mills. According to *A Study of Economics of Fishmeal Production and Market in Quality Assurance System* by Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives (MOAC) (2012), 94.86% of fishmeal produced in central and eastern regions of Thailand was sold to animal feed mills. This is similar to the finding of *Economics of Fishmeal Production and Market in Upper South Region in 2007* by 8th Regional Office of Agricultural Economics, MOAC (2008) that shows that 95.48% of fishmeal produced on the Andaman Sea side of southern region was sold to animal feed mills. The slight difference is on the Gulf of Thailand side of southern region where only 78.07% (but still large number) was sold to animal feed mills while 21.21% sold to brokers.

Since animal feed mills were and still are, in many cases, the main buyer of fishmeal, they have higher bargaining power over fishmeal producers to set fishmeal prices, particularly those major animal feed mills (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012). Based on reported

profit and loss statements on Business Data Warehouse of the Department of Business Development, Ministry of Commerce, in 2014, the major animal feed mills include CPF with the revenue of 44,348 million baht, Betagro 28,694 million baht, Krungthai Food 11,862 million baht, Thaiunion Feedmill 3,084 million baht, and Lee Feed Mill (Leepattana) 2,502 million baht.

However, when CPF stopped buying non-IFFO RS fishmeal on June 18, 2015, the situation has changed since CPF used to have 40-50% market share (Prachachart Online, 2014); therefore, when CPF stopped buying, fishmeal producers have sold their products to brokers who will export fishmeal to overseas markets or mix different grades of fishmeal and sell them to animal feed mills. Thus, brokers have become more dominant in the supply chain (Akaravarinechai, 2016, in-depth interview).

Apart from animal feed mills and brokers, another buyer of fishmeal in Thailand is farms, but they share a very tiny proportion of fishmeal production – less than 1% (8th Regional Office of Agricultural Economics, Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2008) (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012).

2.1.3 Thailand's fishmeal exports

From Figure 2, it is also clear that Thailand's fishmeal production is mainly for domestic consumption until 2013 when the number of exported fishmeal has started growing dramatically from around 13% in 2012 to about 26% in 2013 then to 37% in 2014 and 42% in 2015. The five major fishmeal exporting destinations in 2015 are China (61,339.12 tons), Japan (37,080.50 tons), Vietnam (32,167.35 tons), Taiwan (10,697.02 tons), and Bangladesh (7,267.17 tons) (see Figure 15) (The Customs Department).

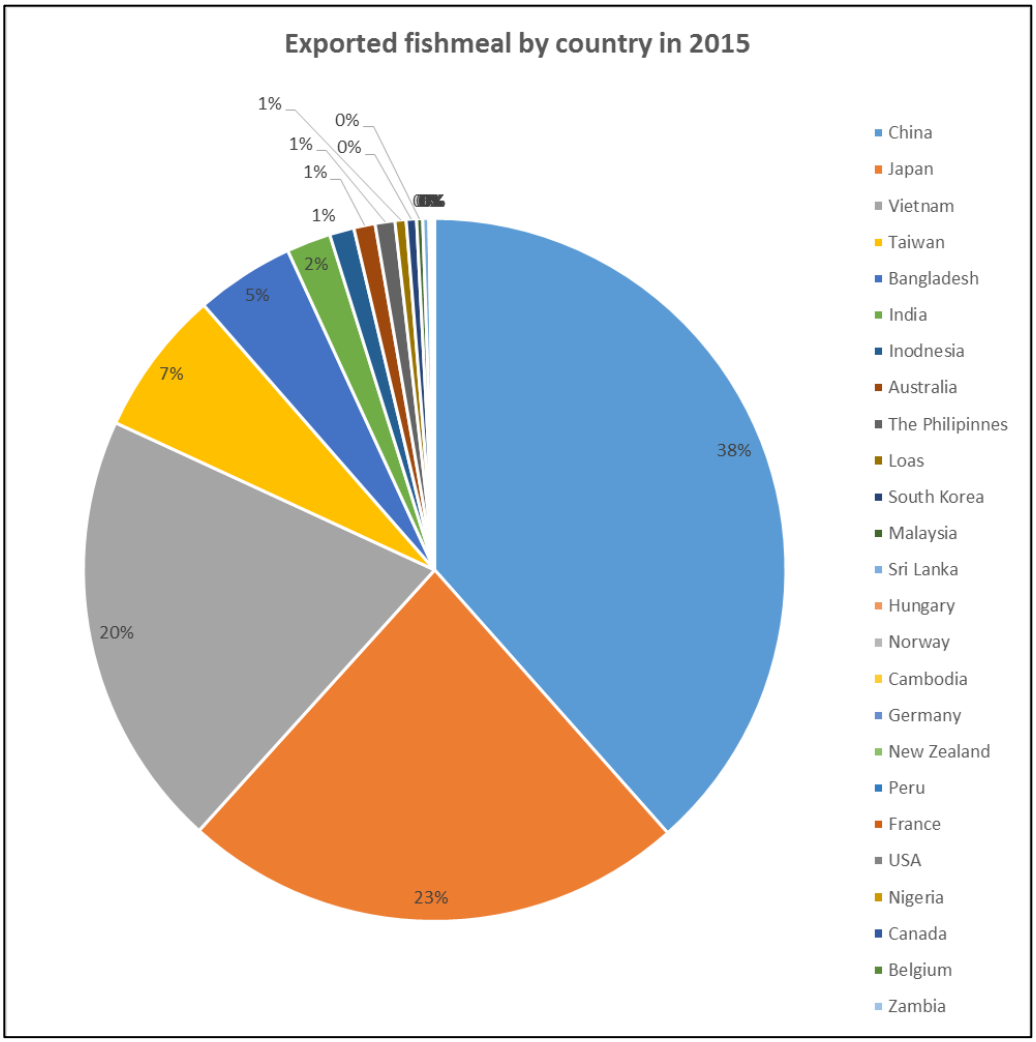

Figure 15 Exported fishmeal by country in 2015. Adapted from *The amount of exported fishmeal from January to December 2015*, by TFPA, 2016, Retrieved April 19, 2016 from http://www.thaifishmeal.com/index.php?option=com_content&view=article&id=471:35-02-16-31-2559&catid=44&Itemid=131&lang=en

The increases in the amount of exported fishmeal in 2014 – 2015 are partly due to the fact that CPF that used to be the largest fishmeal buyer stopped buying domestic fishmeal except IFFO RS approved fishmeal, so the fishmeal producers that used to supply fishmeal to CPF have to find new buyers. Thus, fishmeal producers have sold their products to exporting brokers more (Akaravarinechai, 2016, in-depth interview).

2.1.4 Thailand's fishmeal imports

Since Thailand can produce only 25% of fishmeal containing 60%+ protein, Thailand has to rely on the importation of high protein fishmeal from other countries (Animal Feed Business, 2011 cited in Achavanuntakul, et al., 2014) From Figure 4, it is obvious that Thailand has imported only a small proportion of fishmeal compared to domestic consumption of locally produced fishmeal. From 2007 to 2013, the imported fishmeal accounted only 1-3% of total fishmeal consumptions while the number started rising in 2014 to 6% (19,106.58 tons) to 11% (27,497.48 tons) in 2015. The two major fishmeal importing countries in 2015 are Myanmar (15,120 tons) and Vietnam (10,642.4tons) (see Figure 16).

According to the Export and Import Goods Act B.E. 2522 (1979), fishmeal is a restricted item, and by the Notification of the Ministry of Commerce on the importation of goods (No. 75) B.E. 2533 (1990), importation of fishmeal with protein content lower than 60% requires a permission from the Department of Foreign Trade. The Cabinet will consider fishmeal importation policies every three years, and for 2015-2017, all import tariffs of all grades of fishmeal are levied 0%under all effective free trade agreements. For importation of fishmeal under normal condition, most favored nations (MFN) tariff will be applied. For fishmeal with protein content more than 60%, the tariff is 15% while for fishmeal with protein content lower 60%, the tariff is 6% (Office of Agriculture Economics, 2015)

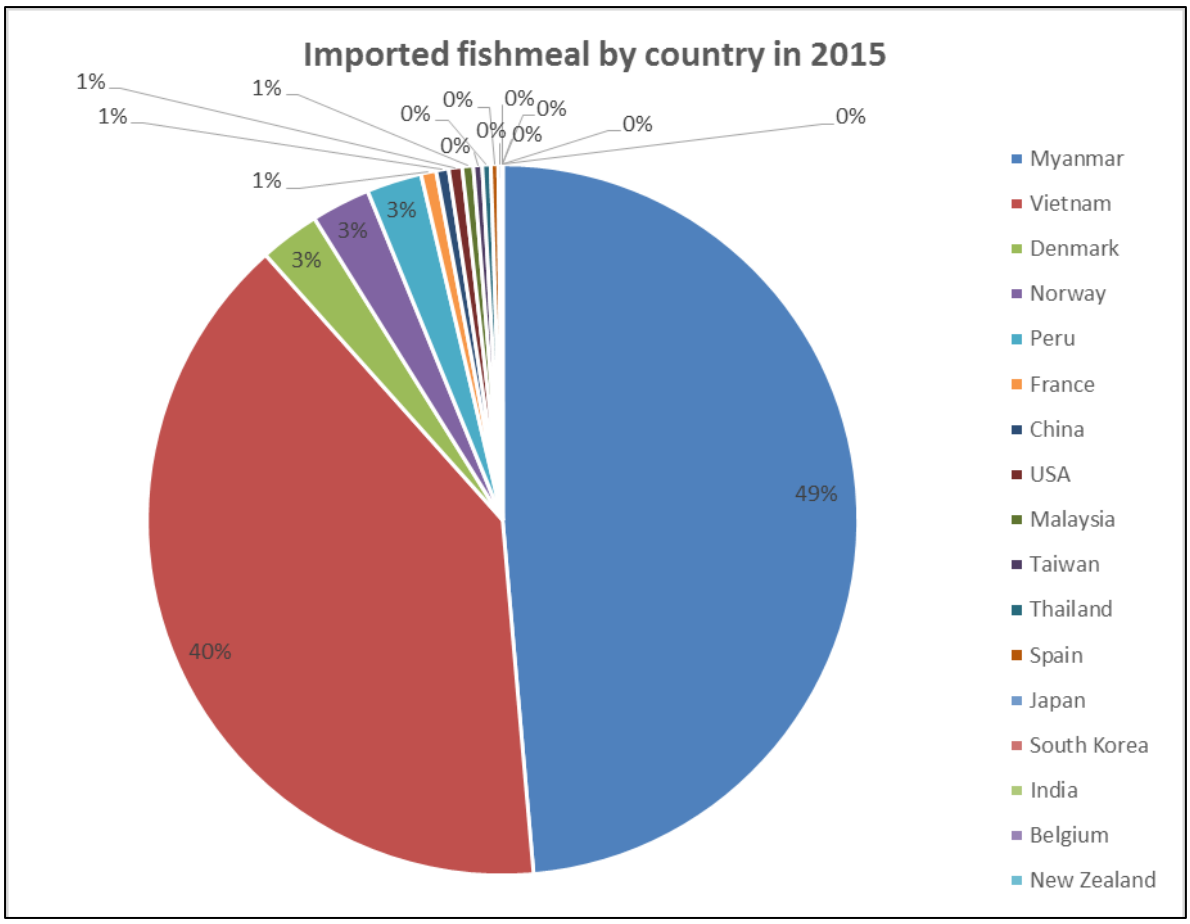

Figure 16 Imported fishmeal by country in 2015. Adapted from *The amount of imported fishmeal from January to December 2015*, by TFPA, 2016, Retrieved April 19, 2016 from http://www.thaifishmeal.com/index.php?option=com_content&view=article&id=471:35-02-16-31-2559&catid=44&Itemid=131&lang=en

2.2 History and Important Milestones of Fishmeal Industry in Thailand

Fishmeal production in Thailand has a long history over 50 years, but there is no record when it was first started. First recorded case in the history of the fishmeal industry was when FAO gave a fishmeal processing machinery to Thai Fisheries co. ltd. which was half state enterprise half private company for a pilot production in 1952 (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012). Since then, Thai fishmeal industry has developed and evolved through several occurrences which can be divided into six eras as follows:

1. Household production era (before 1961)
2. Industrialized production era (1961 – 1976)
3. Association era (1977 – 1996)
4. By-product production era (1997 – 2007)
5. Standardized production era (2008 – 2012)
6. Sustainable production era (2013 to present)

2.2.1 Household production era (before 1961)

In the past, two complementary businesses that were popular in coastal provinces were commercial fisheries using bamboo strake traps and set bag nets, and Layer duck farms because caught fish that were not suitable for human consumption would be used to feed Layer ducks which could stimulate duck growth and productivity.

At that time, fishmeal was produced within the households using big pans to cook the fish and pressed the cooked fish with manual tools and then dried them on bamboo mats for a few days, but in some places, the fish were grilled in iron pans until they were dry. After that they would be grounded and sold afterwards. Fishmeal produced from this process was low quality fishmeal.

In 1952, as mentioned earlier, FAO gave a fishmeal processing machinery to Thai Fisheries co. ltd. for a pilot production and in 1954, the company bought another machinery for its pilot plant which had a full production capacity of 25 tons of raw materials per day; however, the project was not successful due to the differences of raw materials and irregular supply of raw materials. There were attempts from two factories, one at Ranong province and the other was a boat factory, to run fishmeal factories by copying the machinery, but again, they were also unsuccessful due to the shortage of regular supply of raw materials.

2.2.2 Industrialized production era (1961 – 1976)

In this era, trawlers had been introduced to Thailand and became a successful fishing gear leading to the abundant and regular supply of raw materials for fishmeal producers. Thus, the problem of short supply as in the previous era was eliminated which resulted in the industrialization of fishmeal production. Also, during this period, poultry farms were promoted and industrialized widely in Thailand which led increasing demands for feeds and fishmeal. Fishmeal left from the domestic consumption was exported.

2.2.3 Association era (1977 – 1996)

During this period, while the fishmeal industry was booming at every coastal province, fishmeal producers had imported new machinery to use in their production; some producers modified their fishmeal processing machines to increase their efficiency and productivity. In addition, fishmeal producers started to use by-products from fish canning factories as trawlers could catch less fish. At this time, shrimp farms were promoted resulting in such higher demands of fishmeal that they needed to import fishmeal to produce animal feeds as local production was not sufficient. Also, Thai Fishmeal Producers Association (TFPA) was founded in 1981 to be a center and assist fishmeal producers in Thailand.

2.2.4 By-product production era (1997 – 2007)

At this period, by-products from tuna canning manufacturers and surimi producers replaced trash fish as the main raw materials for fishmeal production as Thailand had by-products from these factories more than 100,000 tons per year. However, Thailand also

imported trash fish from Thai fishing boats operating in Myanmar, Malaysia, Vietnam and Indonesia.

As for the production, the quality of raw materials and fishmeal production were improved. Locally produced fishmeal was mainly used in the country since livestock and aquaculture industry were promoted widely. Due the higher quality of fishmeal, Thailand could export fishmeal to several countries such as China, Vietnam, Taiwan, and Japan (Bureau of Agricultural Economics Research, Ministry of Agriculture and Cooperatives of Thailand (MOAC), 2012).

2.2.5 Standardized production era (2008 – 2012)

During this period, many fishmeal producers adopted quality assurance systems which help improve the quality of their products. Since 2008, TFPA with the Department of Foreign Trade, Ministry of Commerce started projects to help facilitate fishmeal producers to adopt Good Manufacturing Practices (GMP) and Hazard Analysis Critical Control Point (HACCP) in their operations in order to increase animal feed safety and increase competitiveness of Thai fishmeal producers (Thai Fishmeal Producers Association, 2009a; 2009b; 2009c). Thus, during this period, the quality of fishmeal became higher, so the overseas clients from China, Vietnam, Indonesia, Japan, and Taiwan were interested to buy fishmeal from Thailand leading to a sharp rise of fishmeal exports in 2010 (Thai Fishmeal Producers Association, 2011b).

However, during this period, there were several incidents affecting the demands for fishmeal in the country starting in 2011, there were floods in southern region and many other areas of Thailand, especially in the southern region, the flood destroyed around 1,000 shrimp farms causing the demands for fishmeal in the country to decline (Thai Fishmeal Producers Association, 2011a). Also, around the end of the same year, shrimp farms in Thailand were

attacked by Early Mortality Syndrome (EMS) causing a large amount of farmed shrimps to die after they were released into the ponds within 35 days. This disease damaged the shrimp industry of Thailand very badly (Thai Frozen Foods Association, 2014) leading decreasing demands for shrimp feeds (5/55) (Thai Fishmeal Producers Association, 2012b).

Also, animal feed mills, both in Thailand and China, adjusted their livestock feed formula and substituted fishmeal with Meat and Bone Meal (MBM) to reduce costs since MBM was much cheaper than fishmeal (Thai Fishmeal Producers Association, 2011c), so even though there were higher demands for products from livestock and subsequently for protein ingredients for feeds, the demand for fishmeal was not higher as animal feed mills substituted fishmeal with MBM in livestock feeds (Thai Fishmeal Producers Association, 2012a).

2.2.6 Sustainable production era (2013 to present)

In this period, Thai fishmeal industry still experience the low demands of fishmeal for shrimp feeds, but it was compensated by higher demands from overseas such as China, Vietnam, Indonesia causing fishmeal exports to increase dramatically.

Also, during this period, the sustainability issues in the fisheries industry have started to affect Thai fishmeal industry beginning with that the DoF along with the Department of Livestock Development, TFPA, Thai Feed Mill Association (TFMA), and National Fisheries Association Thailand launched the fishmeal certificate scheme on July 1st, 2013 in order to create trust and a good brand image for Thai fishery products. This voluntary scheme uses financial incentives from animal feed mills to encourage fishmeal producers to provide traceability documents (DoF, TFPA, TFMA Synergize to Create Fishmeal Certificate Scheme to Prevent Trade Barrier from Clients, 2013).

After the fishmeal certificate scheme was launched for a year, there were huge headlines, on the Guardian, an online newspaper, publishing, as mentioned earlier, an investigation of the shrimp supply chain in Thailand showing CPF had engaged in slave labors by buying fishmeal from some suppliers who bought fish from fishing boats that used slave labors June 10th, 2014 (Trafficked into slavery on Thai trawlers to catch food for prawns, 2014). This has a huge effect on the fishmeal industry because not very long after the news, CPF, the major fishmeal buyer who at that time bought about 40-50% of Thai fishmeal, decided to stop buying fishmeal for two months (June-July 2014). Thus, during this time, fishmeal producers had to rely on exporting(Thai Fishmeal Producers Association, 2014b; Thai Fishmeal Producers Association, 2014e). So, when CPF bought fishmeal again, it quoted fishmeal prices very high (e.g. shrimp grade fishmeal used to be 31.50 baht per kilogram, and new price was 42.50 baht) with the conditions that the fishmeal sold to CPF had to have documents for traceability that could prove that the fishmeal was sourced responsibly, not using slave labors (Prachachart Online, 2014). This divides fishmeal market in Thailand into two markets: one is major animal feed mills that require traceability documents, and the other is small animal feed mills, brokers or exporters that do not need the documents(Thai Fishmeal Producers Association, 2015a).

After Thai fishing industry was shaken by the Guardian's investigation about a year, it received another bad news about that Thailand received a Yellow card the EC regarding Thailand's failure to handle IUU fishing (European Commission, 2015). And this became an urgent agenda of Thai military government since it could lead to a trade ban that will cost Thai fishing industry around 500 million USD if Thailand cannot solve the IUU problem and get a Red card from the EC (Prachachart Online, 2015), so May 6th, 2015, the government founded the Command Center for Combat Illegal Fishing (CCCIF) to grapple with the IUU fishing problems in Thailand (CCCIF Strictly Controls Thai Fisheries, 2015). The CCCIF has

started tackling the problem by strictly enforcing the law on illegal fishing boats that do not have valid fishing gear licenses and fishing vessel registrations, causing about 8,000 illegal fishing boats to stop operating (Thai Fishmeal Producers Association, 2016). Of course, this has directly affected fishmeal producers because they lose 50% of raw materials that are whole fish and trimmings from surimi producers; however, trimmings from tuna canning factories have not been affected since 90% of tunas are imported (Thai Fishmeal Producers Association, 2015e).

Another landscape – changing incident during this time is when CPF, who used to buy 40-50% of fishmeal production, announced that it will only purchase IFFO RS approved fishmeal, saying that it was pressured by international clients. It means that all of its suppliers but one can no longer sell their products to CPF. CPF tried to encourage fishmeal producers to adopt IFFO RS standard by increasing fishmeal prices three times and inviting some fishmeal producers to adopt the standard under chain of custody of CPF (Thai Fishmeal Producers Association, 2016).

When the largest buyer stopped buying, it surely affects the industry. First, CPF's prices used to be used as the reference prices in the industry, but since it stopped buying non-IFFO RS approved fishmeal, its prices were eventually ignored by both sellers and buyers of fishmeal. Second, the end of the year which is the winter season is the low season of aquacultures both in Thailand and globally; therefore, demands for and prices of fishmeal decline accordingly. In the past, even though the prices were low, fishmeal producers could still sell their products to the large animal feed mill like CPF who has enough money and warehouses. But after CPF stopped buying non-IFFO RS approved fishmeal, the supply of the local fishmeal has been partly released through exports and accumulated since then. Thus, when there were low demands for fishmeal from overseas clients, and Thai exporters had limited money and warehouses to absorb the fishmeal supply, Thai fishmeal producers

experienced the situation of oversupply of fishmeal for the first time (Thai Fishmeal Producers Association, 2016).

2.3 IFFO Responsible Supply of Fishmeal and Fish Oil (IFFO RS) Standard

The IFFO RS standard is a voluntary business-to-business certification standard for fishmeal and fish oil producers by the Marine Ingredients Organisation, formerly known as International Fishmeal and Fish Oil Organisation (IFFO). With the vision that "all marine ingredients produced globally will be sourced from responsibly sourced fisheries products and produced in a safe manner", the standard focuses on responsible sourcing, traceability, and manufacturing (IFFO, IFFO RS Standard, n.d.). The IFFO RS standard and the IFFO RS Chain of Custody standard (IFFO RS COC) were launched since 2009 and 2011 respectively (IFFO, IFFO RS History, n.d.). The percentage of IFFO RS approved fishmeal worldwide has increased from 25% of total fishmeal production in 2010 to 41% in 2015, and in 2016 the number is expected to grow to 45% from 118 factories in 15 countries. The top five IFFO RS approved fishmeal producing countries are Peru, Chile, Norway, Denmark, and Iceland (IFFO, IFFO RS Statistics, n.d.).

As noted earlier, the IFFO RS standard focuses on three pillars: responsible sourcing, traceability, and manufacturing. For responsible sourcing, certified fishmeal producers have to source their raw materials from 'responsibly managed fisheries'. What it means by 'responsibly managed fisheries' is 1) whole fish must come from sources that comply with the FAO Code of Conduct for Responsible Fisheries 1995; 2) there must be assessments on science-based requirements for the protection of fish stocks, habitats, and the environment; 3) by-products must come from fish prepared for people to eat and must not be endangered fish from IUCN's Red list; and 4) no fish or fish by-products from Illegal Unregulated Unreported (IUU) fishing may be used. For responsible traceability, fishmeal producers must be able to

trace its raw materials to ensure that only IFFO RS compliant raw materials are used in production. Last, for responsible manufacturing, certified firms must be certified by the International Feed Ingredients Standard (IFIS) or other equivalent standard (IFFO, IFFO RS Standard, n.d.).

The IFFO RS standard is a third-party certification standard, so applicants are assessed by a third-party certification body which conducts fishery assessments and on-site audits. Applicants can choose a certification body from the two official certification bodies for the IFFO RS standard: SAI Global or SGS. These are auditing companies and have branches in many countries. In Thailand, SAI Global is the only one that has an office locally (IFFO, IFFO certification bodies, n.d.); therefore, all fishmeal producers certified by the IFFO RS standard have been assessed by SAI Global.

Regarding the requirements on raw materials used in the production of IFFO RS certified fishmeal, utilization of irresponsibly sourced fish, either from IUU fisheries or fisheries not complying with the Code of FAO, is prohibited. Hence, the adoption of the IFFO RS standard can help prevent adopting fishmeal producers and their buyers from the problems mentioned earlier in this thesis.

CHAPTER 3

LITERATURE REVIEWS

3.1 Third-party Certification Standards

In this section, the definition of a third-party, voluntary certification standard - the IFFO RS standard - its functions, and the problems related to standard adoption are explained. To understand what the third-party, voluntary certification standard is, three elements need to be described: 1) third-party certification, 2) voluntary standard, and 3) certification standard. The three elements talk about three different features of the standard. The first element is the third-party certification. Third-party certification is an assurance system ensuring the stakeholders that a product meets a minimum level quality according to a specific standard. This certification is provided by a certifier which is a private or public organization that is independent from other actors in the supply chain. This certifier accesses, evaluates, and certifies a product objectively and transparently. These qualities (independent, objective, and transparent) enable the certified company gain trust and legitimacy from its clients (Hatanaka *et al.*, 2005; Gilbert *et al*., 2011).

The second element, voluntary standard, is sometimes referred to as 'private standard' or 'private voluntary standard' (Komives & Jackson, 2014). This type of standard has been developed and adopted by private organizations. 'Voluntary' indicates that this standard has no legal obligation regarding compliance. Rather, the standard has been adopted because of its perceived value. However, in some cases, it is necessary to adopt the standard in order to enter a certain market because of the market power of the adopters in that market (Henson & Humphrey, 2010: Gilbert *et al*., 2011).

The last element is certification standard. Gilbert et al. (2011) categorize accountability standards for private sectors into four types: 1) principle-based standards, 2) certification standards, 3) reporting standards, and 4) process standards. Certification standards include processes of certifying, verifying, and monitoring a system or production process against sets of particular standards. Verification and monitoring processes are the core of certification standards as they help validate the company's activities. The Forest Stewardship Council (FSC) certification and Marine Stewardship Council (MSC) certification are well-known certification standards. The IFFO RS standard is this type of standards as well.

Even though we have explained each element of third-party voluntary certification standards separately, in fact they are interrelated. Private certification standards are usually adopted on a voluntary basis, though sometimes because of market pressure. And they are certified, verified, and audited by third-party certifiers who are independent from other actors in the supply chain (Hatanaka *et al*., 2005; Henson & Humphrey, 2010; Gilbert *et al*., 2011).

As noted earlier, third-party voluntary certification standards evaluate, verify, and certify producers' activities against sets of certain standards from which consumers perceive their value. And the certification standards work as endorsement for the certified products making them more appealing to consumers who will eventually buy more for the certified products even though the prices of certified products tend to be higher. And these higher prices and increasing amount of sales, in turn, will create market benefits and attract more producers to adopt the standards (Ward & Philips, 2008). Figure 18 shows the model of a voluntary sustainability standard.

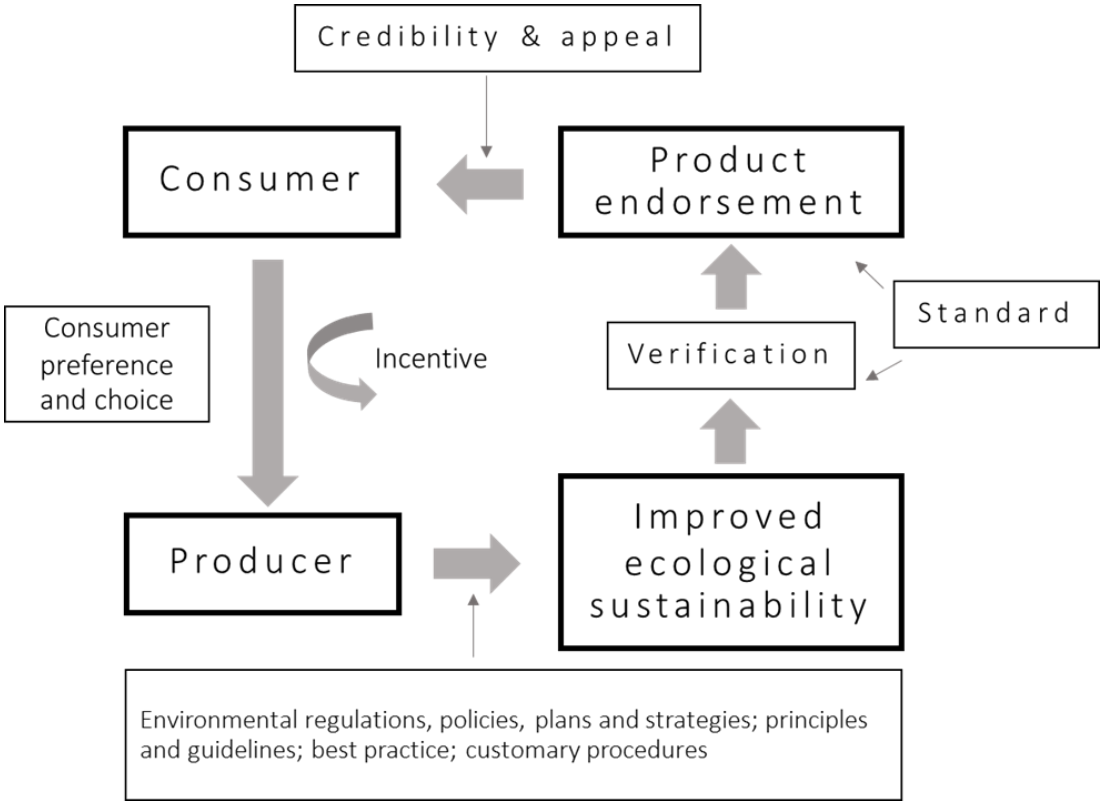

Figure 17 Model of a voluntary sustainability standard

Source: Ward & Philips 2008

Several journal papers have proclaimed the virtues of third-party, voluntary certification standards because they help address social and environmental problems (Sedjo & Swallow, 2002; Fischer *et al*., 2005; Hatanaka *et al*., 2005; Goyert *et al*., 2010; Perez-Ramirez *et al*., 2012b; Qijun & Batt, 2015). However, many of them such as FSC and MSC have experienced some criticisms that they favor producers in developed countries (Fischer *et al*., 2005; Perez-Ramirez *et al*., 2012b). FSC, for example, was adopted and has been practiced mostly by producers in developed countries. The FSC certified forests in developing countries remain a small fraction – only 8% of total certified forests (Fischer *et al*., 2005). This is the case with the IFFO RS standard as well. Figure 19 shows that most IFFO RS compliant products are expected to be made by producers in developed countries (the portions from Chile to USA) after we exclude the portion of Peru. We exclude Peru's

portion because Peru is the outlier. Even though Peru is a developing country, it is the world largest fishmeal producing country, so its fishmeal industry is much more prominent and advanced than those of other developing countries. Therefore, if we include it in the developing countries' portion, it can be misleading that producers in developing countries can produce IFFO RS compliant products as much as their counterparts in developed nations.

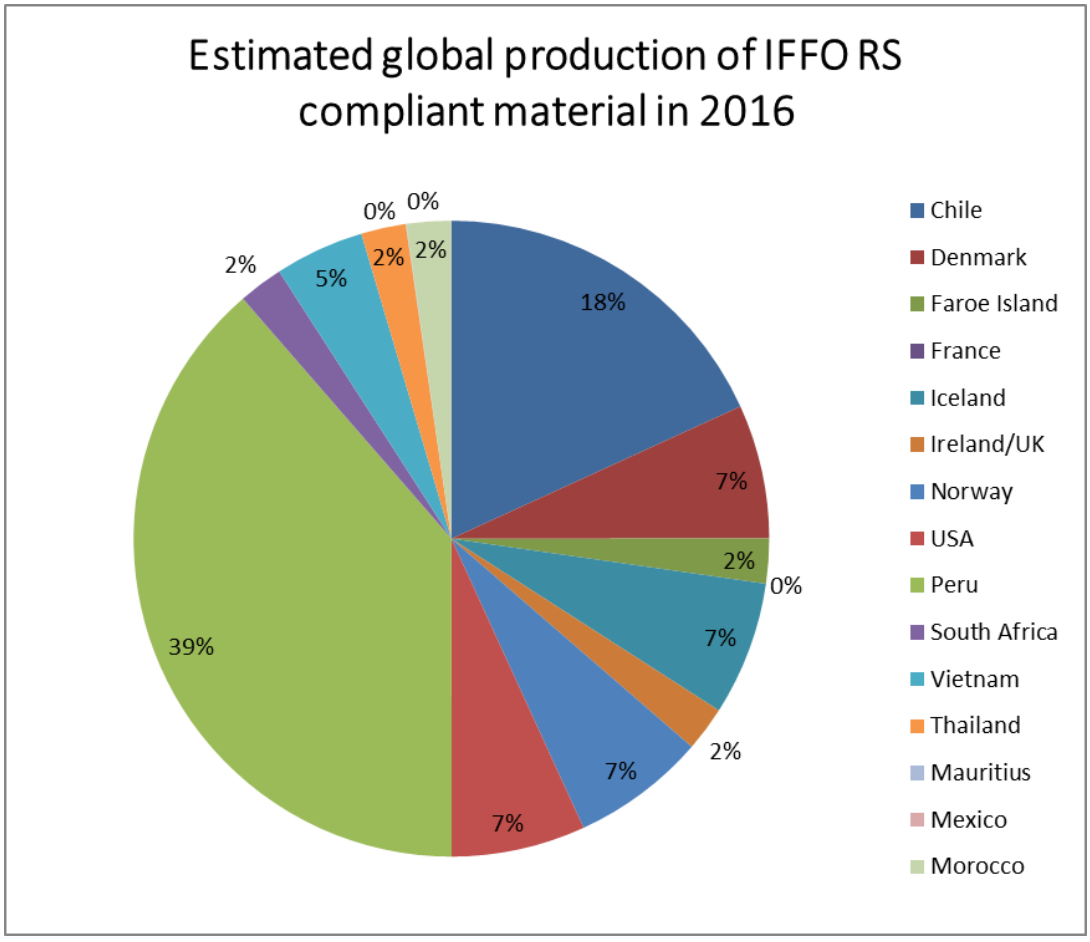

Figure 18 Estimated global production of IFFO RS compliant material in 2016. Adapted from IFFO RS Statistics by IFFO, Retrieved December 5, 2016, from http://www.iffo.net/iffo-rs-statistics

More producers in developed countries are able to adopt third-party certification standards than their counterparts in developing nations perhaps because developed countries usually have regulations that buttress the standard adoption. Having said this, the intention of

third-party certification standards to cope with unsustainable practices in developing countries is rather futile. And because the demand for certified products often comes from developed countries, only companies exporting to these countries receive price premiums. The demand for certified products in developing countries is also limited by willingness and ability to pay of the local consumers (Fischer *et al*., 2005).

3.2 Sustainable Supply Chain Management

Although this study is about identifying factors that influence fishmeal producers to adopt the IFFO RS standard, it is essential to understand the concept of sustainable supply chain management (SSCM) because fishmeal producers are part of fishmeal supply chains, and decision to adopt the IFFO RS standard can be part of SSCM.

Sustainable supply chain management consists of two concepts combining together. The first one is the concept of business sustainability, and the second one is the concept of supply chain management (SCM). Business sustainability is sometimes referred to as corporate sustainability. Ahi and Searcy (2013) summarize and compare definitions of business sustainability from eight papers. The definitions of more than half of the reviewed papers focus on economic, environmental, social, and long term aspects. For example, one definition of business sustainability is “the ability to conduct business with a long term goal of maintain the well-being of the economy, environment and society” (Hassini et al, 2012 cited in Ahi & Searcy, 2013).

SCM was initiated in early 1980s as a concept of planning and control logistics activities and flow of materials and information within a company and between companies. At the beginning, it focused at flows of materials and then expanded to cover many other aspects such risk and performance (Ahi & Searcy, 2013). Mentzer et al. (2002 p.18) define

the term as “the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole”. Ahi and Searcy (2013) also reviewed the definition of SCM in eight papers and found that more than half of the reviewed papers focus on flow, coordination, and stakeholder aspects. The goals of SCM are to reduce non-value-added activities and related costs, response to customers better and more quickly, and increase the bottom line and financial competitiveness (Stewart, 1995 cited in Hsiao, Purchase, & Rahman, 2002).

From these two concepts, the term SSCM is defined by Carter and Rogers (2008, p.368) as “the strategic, transparent integration and achievement of an organization’s social, environmental, and economic goals in the systemic coordination of key interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains” and by Seuring and Muller (2008, p.1700) as “the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental, and social, into account which are derived from customer and stakeholder requirements”. From definitions, SSCM generally focuses on economic, environmental, social, flows of materials, service, and information; and coordination aspects (Ahi & Searcy, 2013).

Another concept related to SCM and SSCM is the concept of green supply chain management (GSCM). When sustainability started to integrate into SCM, it began with combining environmental or ‘green’ aspects into SCM, and after that the literature about GSCM has continuously grown. Srivastava (2007, p.54-55) defines the term as “integrating environmental thinking into supply-chain management, including product design, material

sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life". From the definitions, we can see that SSCM and GSCM have similar concepts except that GSCM only focus on environmental aspect while SSCM integrates the three dimensions of sustainability into the SCM concept.

3.3 Bargaining Power in Supply Chain

From the resource dependence theory, a company's power in a supply chain relies on other firms' dependence on the company for resources; therefore when a company adopts SCM, other firms in the supply chain are the company's environment, so the relatives need of resources of each member in the supply chain form each member's power. A company has power to the extent of others' dependence on its resources, and the importance of and concentrated control over resources create dependencies. Resources become important 1) when they represent a high proportion of inputs or outputs of a firm - magnitude – and 2) when a company cannot operate without them – criticality (Crook & Combs, 2007).

However, Jabbour et al. (2013) look from another viewpoint. They mention that the player with the greatest bargaining power in the supply chain is the one farthest end close to the final consumer. This is because consumer pressure is strongest on a company closest to the consumer and fades away along to the upstream players (Gonzalez-Benito and Gonzalez-Benito, 2006 cited in Jabbour et al., 2013). Consequently, if the strongest company in the supply chain desires to adopt environmental management, for example, the other firms in the chain tend to adopt it, too (Nawrocka, 2008 cited in Jabbour et al., 2013).

3.4 Drivers and Barriers to the Adoption of Third-Party Certification Standards

3.4.1 Drivers of third-party certification adoptions

Much literature on third-party certification adoptions has shown that producers are driven to adopt third-party certification standards because of the markets, either to maintain the current market, being pressured by retailers or other stakeholders, or to access new markets (Hatanaka et al., 2005; Goyert et al., 2010; Gilbert et al., 2011; Perez-Ramirez et al., 2012b; Qijun & Batt, 2015). Goyert et al. (2010) discussed how lobstermen in Maine expected to get benefits of increasing market penetration to a market such as Europe, or gaining advantage of product differentiation through MSC program. Perez-Ramirez et al. (2012b) who tried to identify main motivation which made Argentinian fisheries to adopt MSC certification found similar results showing that maintaining in the current market and accessing to new markets are the main motivations.

Drivers to the adoption include benefits of standard adoption which can be divided into economic benefits and non-economic benefits. The economic benefits are usually related to 1) remaining in the existing market (Hatanaka et al., 2005; Goyert et al., 2010; Perez-Ramirez et al., 2012b), 2) entering new markets (Hatanaka et al., 2005; Goyert et al., 2010; Perez-Ramirez et al., 2012b), 3) receiving a price premium (Goyert et al., 2010; Konefal & Hatanaka, 2011; Perez-Ramirez et al., 2012a), 4) differentiating from other companies(Goyert et al., 2010), and 5) enhancing reputation and brand (Perez-Ramirez et al., 2012a). Non-economic benefits include 1) creating international recognition (Perez-Ramirez et al., 2012a; 2012b), 2) creating negotiation power (Perez-Ramirez et al., 2012a; 2012b), 3) protecting catch quotas (Perez-Ramirez et al., 2012a), 4) receiving government's economic support (Perez-Ramirez et al., 2012a; 2012b), and 5) forging trust among actors in supply chains (Hatanaka et al., 2005).

3.4.2 Barriers of third-party certification adoptions

Similarly to the drivers, barriers in third-party certification standard literature can be divided into economic and non-economic barriers. However, barriers to third-party certification standards are associated mainly with financial resources needed for the adoption (Hatanaka et al., 2005), mostly being costs of certification including pre-assessment cost, annual audits, annual license fee (Ponte, 2006; Perez-Ramirez et al., 2012a), and in some cases, levies (Goyert et al., 2010).

Non-economic barrier is administrative capacity needed to adopt the standards. Adopting companies may need to hire more workers to handle extra daily paperwork related to standard compliance (Hatanaka et al., 2005; Perez-Ramirez et al., 2012a). Organizational changes and technological upgrades can be obstacles that hinder standard adoption (Hatanaka et al., 2005). Also, company size can be a barrier because small companies will not receive benefits from the standard adoption as much as larger counterparts because of the economies of scale. Small producers have to bear higher costs of certification per unit of certified products than large ones do (Fischer et al., 2005; Hatanaka et al., 2005). For example, Fletcher et al. (2002) cited in Fischer et al. (2005) explain that in the US, costs of FSC certification can be a few hundred dollars per acre for small producers, but only 10 cents per acre for large one.

3.5 Drivers and Barriers to the Adoption of Green/Sustainable Supply Chain Management

3.5.1 Drivers of the Adoption of Green/Sustainable Supply Chain Management

In GSCM literature, many authors refer the institutional theory or the components of this theory to explain factors that drive companies to adopt green supply chain management

(Clemens & Douglas, 2006; Walker, Sisto, & McBain, 2008; Holt & Ghobadian, 2009; Hsu, Tan, Zailani, & Jayaraman, 2013; Kamolkittiwong & Phruksaphanrat, 2015). They explain that drivers affecting firms' decision include regulations, competitors, customers, and society affect firms' decision. Walker et al. (2008), Holt & Ghobadian (2009), and Kamolkittiwong & Phruksaphanrat (2015) divide the drivers into external and internal factors. Internal factors refer to organizational-related factors such as values of owners or managers, desire to reduce costs, and employee involvement, whereas external factors are regulations, competitors, buyers, and society.

Similar to GSCM, drivers of SSCM can be divided into internal and external drivers. External drivers include government policy, regulation, competitors, customers, collaboration with suppliers, pressure from investors, and influence from NGOs. Internal drivers consist of top management commitment, employee involvement, culture, alignment of company strategy with supply strategy, firm competitiveness, reputational and environmental risk, large organizational size, and capabilities with supply function (Walker & Jones, 2012).

3.5.2 Barriers to the Adoption of Green/Sustainable Supply Chain Management

Barriers identified in GSCM consist of some components similar to those discussed in aforementioned third-party certification standards such as costs (Walker, Sisto, & McBain, 2008; Luthra, Kumar, Kumar, & Haleem, 2011; Dashore & Sohani, 2013), and low quality human resources (Luthra et al., 2011). Walker et al. (2008) group barriers into two groups: internal and external. Internal barriers include costs and lack of legitimacy while external barriers are regulation, lack of supplier commitment, and industry specific barriers. From this, it is obvious that a barrier can be a driver as well. In case of regulation, it can work for or against the adoption of green supply chain practices. As for industry specific barriers, Luthra

et al., (2011) explain that lack of IT implementation can be a barrier to the green supply chain management adoption because information flows of materials between each party in the supply chain are crucial to achieve green supply chain management in the automobile industry. They also identify other barriers, similar to other authors, including lack of governmental support, costs, lack of supplier commitment, and lack of top management commitment.

Barriers to SSCM adoption can also be categorized into two groups: internal and external barriers. External barriers are regulations, competitive pressures, customer desire for lower prices, poor supplier commitment, and greenwashing. Internal barriers include lack of management commitment, costs, traditional accounting methods, small organizational size, lack of training, lack of knowledge, and lack of corporate structure (Walker & Jones, 2012).

From the aforementioned drivers and barriers to the adoption of GSCM and SSCM, we can see that they are overlapping between GSCM and SSCM, and many factors can be either drivers or barriers for companies depending on how companies experience them. Management commitment, for example, can be a driver to the adoption in case that a company has, but this management commitment will become a barrier if a company lacks it.

CHAPTER 4

METHODOLOGY

4.1 Research Design

With the aim to answer the questions “why did only two fishmeal producers adopt the IFFO RS standard at that time?” and “why do other fishmeal producers not adopt the standard despite the price premium offered to them?”, the author has two research objectives as presented previously. The first objective is to identify drivers, barriers, and perception of Thai fishmeal producers that affect the adoption of IFFO RS standard, and the second objective is to understand how other stakeholders in the fishmeal supply chain affect the adoption of IFFO RS standard by Thai fishmeal producers. To achieve the two objectives, the case study methodology is applied to capture the complexity of the case. The author divides the case into two parts based on the objectives. The key issues in the first part are drivers, barriers, and perception related to the standard adoption while the key informants are fishmeal producers. As for the part II, the key issues are requirements of the IFFO RS standard, perception of other stakeholders regarding the standard adoption, and bargaining power in the supply chain. The key informants are other stakeholders in the fishmeal supply chain. The methods used in each part are presented in the subsequent sections.

4.2 Research Scope: Study Site

The study site is Thailand. Thailand is located in the Southeast Asia with Andaman Sea on the West and the Gulf of Thailand on the East. In 2015, there were 76 fishmeal

producers in Thailand located in 16 provinces next to the seas as illustrated in Figure 20. The main fishmeal producing provinces were Samut sakhon, Phuket, Samut prakarn, Songkhla, Nakhon Si Thammarat.

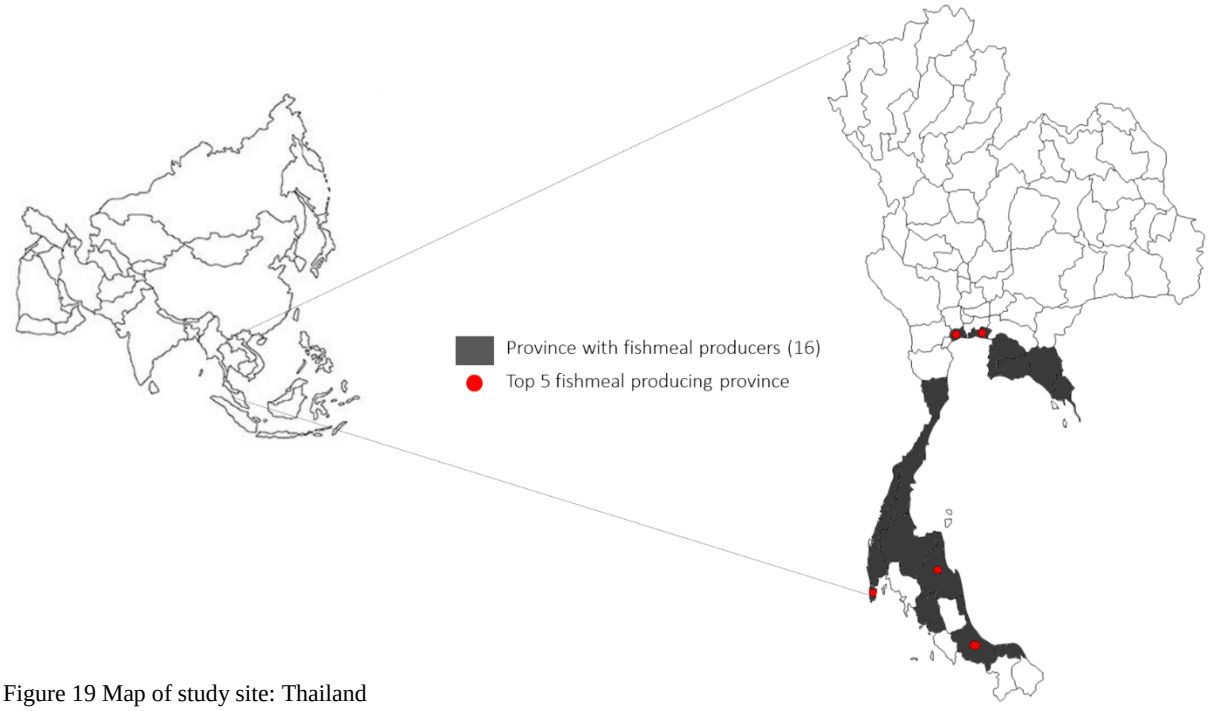

Figure 19 Map of study site: Thailand

4.3 Methods of Part I: Semi-structure, In-depth Interviews with Fishmeal Producers

For part I, the author aims to identify the factors that influence Thai fishmeal producers to adopt the IFFO RS standard, namely drivers, barriers, and perception of fishmeal producers. The study relies on both secondary research comprising of literature reviews of scholarly, peer-reviewed journals and academic books, and qualitative empirical data collected from self-administered, semi-structured, in-depth interviews with Thai fishmeal producers.

To understand the basic factors affecting fishmeal producers' decision to become certified, the author reviewed journal articles regarding third-party certifications, voluntary sustainability standards as well as barriers and benefits of green procurement/technology

adoptions. Apart from peer-reviewed journals, the author also included information from academic books namely, Seafood Ecolabelling Principles and Practice by Ward & Phillips (2008) and Voluntary Standard Systems by Schmitz-Hoffmann, Schmidt, Hansmann & Palekhov (2014). In addition, the analysis of statistical data from Thai Fishmeal Producers Association on fishmeal production and trading helps deepen the understanding of the authors on the situation in Thai fishmeal industry and the contextual implications of the findings.

4.3.1 Preliminary interviews

The first round of interviews was to pilot-test the interview questions. Before having conducted the preliminary interviewed, the author interviewed the President of Thai Fishmeal Producers Association who helped explaining the current situation in the fishmeal industry and the general perception of fishmeal producers towards the IFFO RS standard. Also, he recommended five fishmeal producers to conduct the preliminary interviews. The interviewees in the first round were chosen based on their IFFO RS status (certified or non-certified), and the result of the interviews was used to refine the interview questions used in the second round and to set criteria for interviewee selection in the second round as well. All interviews were administered face-to-face at the fishmeal producers' premises except one that was conducted via a telephone call.

4.3.2 Full-scale interviews

4.3.2.1 Interviewee selection

In the second round, from 76 fishmeal producers in Thailand, 25 interviewees were selected randomly based on their IFFO RS status, size of annual production (<5,000 tons,

5,000-10,000 tons, and >10,000 tons), and type of main raw materials (whole fish, tuna by-products, and trimmings from surimi producers) as shown in Table 5. And for whole fish, we divided them further into 5 fishery regions: eastern, upper Gulf of Thailand, middle Gulf of Thailand, lower Gulf of Thailand, and Andaman Sea in order to see if differences between raw materials supplied from different fishery regions occurred. The aim of setting criteria for the interviewee selection was to compare the results from fishmeal producers with different characteristics, especially between IFFO RS adopters and non-adopters, because the author believe that it will provide an opportunity for new insights since their capabilities and practices are different.

Table 5 Interviewee selection criteria

Type of raw material	Size of annual production			Total
	<5,000 tons	5,000 - 10,000 tons	>10,000 tons	
IFFO RS adopter				4
Non-IFFO RS adopter				
Tuna by-products	1	1	1	3
Surimi by-products	1	1	1	3
Whole fish				
1) Eastern region (Chonburi, Rayong, Chanthaburi, Trat)	1	1	1	3
2) Upper Gulf of Thailand region (Samutsakorn, Samutprakan, Samutsongkram)	1	1	1	3
3) Middle Gulf of Thailand region (Prachuabkirikhan, Chumporn, Nakhon Si Thammarat)	1	1	1	3
4) Lower Gulf of Thailand region (Songkhla, Pattani)	1	1	1	3
5) Andaman Sea region (Ranong, Phang-nga, Phuket, Trang)	1	1	1	3
Total of non-IFFO RS adopter	7	7	7	21
Grand total				25

The selected fishmeal producers were contacted through the Thai Fishmeal Producers Association. From 25 selected fishmeal producers, only 11 fishmeal producers agreed to be interviewed, so totally the author interviewed 16 fishmeal producers from nine provinces namely, Samut Sakhon, Rayong, Prachuabkirikhan, Chumporn, Phang Nga, Phuket, Suratthani, Trang and Songkhla.

4.3.2.2 Interview questions

The interview questions consist of three sections. The first section seeks basic information on the company: main raw materials; annual production capacity, actual annual production, suppliers, and buyers. The second section asks about their participation in the fishmeal certificate scheme which is a local fishmeal traceability scheme led by private sector industries – animal feed and fishmeal – and verified by the Thai's government's Department of Fisheries. This section aims to explore their opinions and experiences with the fishmeal certificate scheme which is supposed to be less rigorous than the IFFO RS standard. The third section is to understand how the interviewees view the IFFO RS standard, if they can adopt it, and why or why not. The interview questions were reviewed by three experts in the field: the President of Thai Fishmeal Producers Association, a senior technical specialist officer from the Department of Fisheries, and a co-founder of a private research company conducting research about the impacts of fishmeal producers in Songkhla province in Southern Thailand on the livelihood of local fishing communities and Thai marine ecosystem in 2014.

4.4 Methods of Part II: Semi-structure, In-depth Interviews with Other Stakeholders

For part II, the author aims to understand how other stakeholders in the fishmeal supply chain influence Thai fishmeal producers to adopt the IFFO RS standard. Thus, the author reviewed journal articles regarding sustainable supply chain management (SCM) and resource-based theory. From the literature review on sustainable SCM, it shows that other stakeholders can be either drivers or barriers to the standard adoption as discussed in the chapter 3. Therefore, in this part, the followings methods were used.

4.4.1 Data-content analysis

To understand the structure of the fishmeal supply chain and identify the key players in the chain, the author reviews and analyzes data from meeting reports of TFPA and the Journal of Animal Feeds of Thai Feed Mill Association, related reports regarding the fishmeal industry as well as the Fisheries Statistics. Then, the author analyzes the requirements of the IFFO RS standard to understand how and which stakeholder needs to be involved in the IFFO RS standard adoption.

4.4.2 Stakeholders identification

After the author analyzed data about the fishmeal industry, the fishmeal supply chain map was created as shown in Figure 21. In this supply chain map, the key players were identified namely fishmeal producers, suppliers, buyers, consumers – both domestic and international, NGOs, and government agency. Suppliers of fishmeal producers include fishing boats, fish processing plants, seafood sellers, and brokers, whereas buyers are farms, animal feed mills, and brokers. Produce from farms is sold locally or exported to international markets. NGOs – local and global alike – monitors practices of key players in the supply chain to reduce impacts of the key players' activities on the environment or local community. Government agency is not part of the supply chain, but because it is a regulator, it is counted as a key stakeholder.

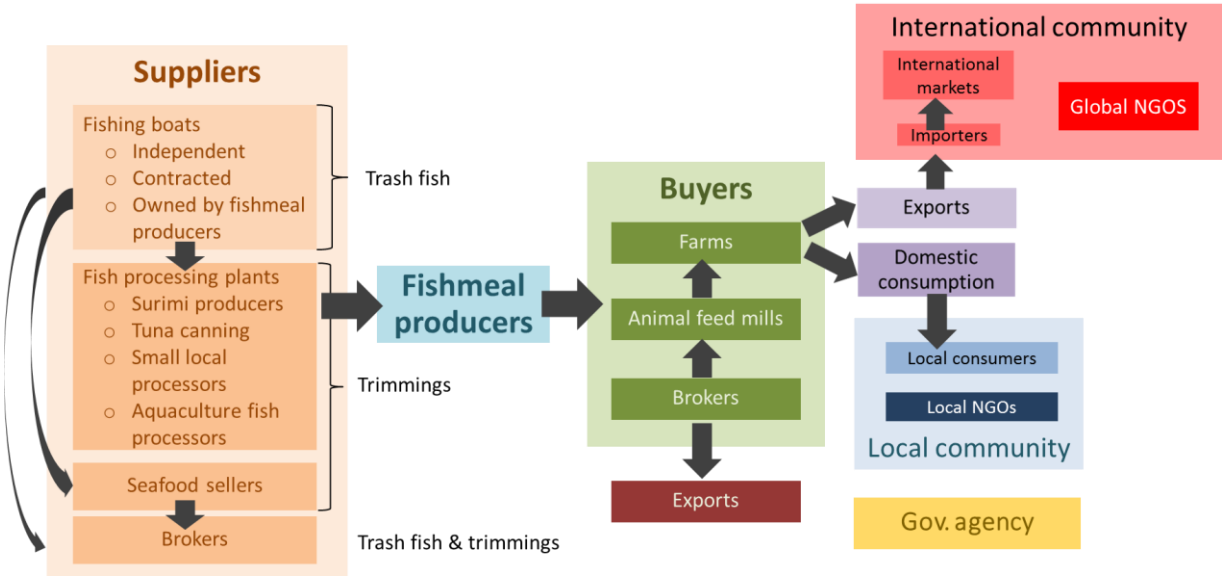

Figure 20 Thailand's Fishmeal Supply Chain Map. Adapted from Economics of Fishmeal Production and Market in Upper South Region in 2007, by 8th Regional Office of Agricultural Economics, 2008, and A Study of Economics of Fishmeal Production and Market under the Quality Assurance System, by Bureau of Agricultural Economics Research, 2012, and Mapping Shrimp Feed Supply Chain in Songkhla Province to Facilitate Feed Dialogue, by Achavanuntakul et al., 2014, and in-depth interviews in March 2016.

After the stakeholders were identified, the author decides which stakeholder will be included in the stakeholder interviews, and for what reason as described in Table 6.

Table 6 Stakeholder selection for semi-structured, in-depth interviews

Stakeholders	Include/exclude	Reasons
Fishmeal producers	Exclude	Focal stakeholder but discussed in part I already
Suppliers	Exclude	Less transparent and less open to public
Buyers - Animal feed mills - Brokers - Farms	 Include Include Exclude	 Major buyers of fishmeal Major buyers of fishmeal Insignificant & difficult to collect data
Local community - Local consumers - Local NGOs	 Exclude Include	 Less influential stakeholder Organization working on social and environmental issues in the fishmeal supply chain
EU & US Community	Exclude	Distant stakeholders
Government agency	Include	Regulator; policy maker

4.4.3 Semi-structured, in-depth interviews

After the key stakeholders were identified and selected, the author decides which firm or organization would be interviewed, and decides to interview two animal feed mills, one broker, one NGO, and one government agency- the Department of Fisheries. Because this part focuses on effects of other stakeholders on fishmeal producers' decision, and fishmeal producers are already interviewed in the part I, the author excludes them in this part. The face-to-face semi-structured interviews were conducted in March and August 2016. The aim of the interview is to understand how other stakeholders perceive the IFFO RS standard – whether they think that the standard is necessary or not.

CHAPTER 5

RESULTS

As discussed in the chapter 4, this study is divided into two parts. The first part aims to identify drivers, barriers and perceptions of Thai fishmeal producers while the second part focuses on understanding the influence of other stakeholders. In this chapter, the results from methods used in the chapter 4 are discussed. Part I will explain the findings from the semi-structured, in-depth interviews with Thai fishmeal producers, whereas the part II will discuss the findings from semi-structured, in-depth interviews with buyers, NGO, and government agency. The results from the two parts will provide a complete picture of the situation that hinders the IFFO RS standard adoption by Thai fishmeal producers.

5.1 Results of Part I: Drivers, Barriers, and Perceptions of Fishmeal Producers

In this part, the findings from the semi-structured interviews with fishmeal producers will be explained beginning with the description of the characteristics of 16 interviewees. The characteristics of adopters and non-adopters are compared to identify key influential characteristics of fishmeal producers to understand how adopters and non-adopters are different. Then, drivers and barriers are discussed. The drivers are mainly pointed out by the adopters while the barriers are identified by non-adopters. Finally, the perception of the fishmeal producers will be explained, and we can understand from the point of view of fishmeal producers why they adopt or do not adopt the IFFO RS standard.

5.1.1 Characteristics of the interviewees

Of 25 selected fishmeal producers in the second round, 11 agreed to be interviewed. When they were combined with five interviewees from the first round, the total number of the interviewees became 16: four IFFO-RS adopters and 12 non-adopters. The interviewees were either owners or managers. The adopters consisted of IFFO RS adopters and those adopting it under the chain of custody of an animal feed mill (IFFO RS CoC). Because the number of adopters was rather limited: only two fishmeal producers (as of August 2016), another two fishmeal producers - which at that time were in the certification process - were included as adopters.

In terms of raw materials, most interviewees used more than one type; however, the main raw materials used by the interviewees could be divided into two main groups: by-catches and by-products. By-catches which sometimes refers to as whole fish is fish caught by fishing boats in contrast to by-products which are heads, bones, tails, and offal of fish from fish processors. The main suppliers of whole fish are fishing boats – both commercial and artisanal – and the suppliers of by-products are tuna canning manufacturers, surimi producers, and aquaculture fish processors. Table 7 shows the characteristics of the 16 interviewees. We can see contrasting features between the adopters and non-adopters in the type of main raw materials and size of annual production. All fishmeal producers using by-catches and surimi by-products as the main inputs are non-adopters, whereas three out of four adopters use tuna by-products. Because of the nature of the business, supplies of whole fish from fishing boats are more unstable and depending on seasons than those from fish processing manufacturers. The amount of trimmings from these fish processing firms depends on the amount of fish the companies can secure.

Table 7 Characteristics of 16 interviewees

Characteristics	Adopter				Non-adopter												Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Type of main raw material																	
Tuna by-product		o	o	o													3
Aquaculture fish by-product	o															o	2
Surimi by-product					o	o	o										3
By-catch (whole fish)								o	o	o	o	o	o	o	o		8
Size of annual production																	
>10,000 tons	o	o	o														3
5,000-10,000 tons				o	o			o	o								4
<5,000 tons						o	o			o	o	o	o	o	o	o	9
Type of organization																	
Stand-alone organization	o							o							o	o	4
Multiple organizations		o	o	o	o	o	o		o	o	o	o	o	o			12

Size of annual productions is another characteristic that highlights the difference between the adopters and the non-adopters. Of four adopters, three can produce more than 10,000 tons per year, whereas the majority of non-adopting interviewees (9 out of 12) have annual productions less than 5,000 tons.

Type of organization is the only feature that shows no difference between the adopters and non-adopters. Most interviewees have fishery-related businesses that help provide raw materials to their fishmeal businesses; only a few are stand-alone companies. One explanation is that industrial fish processors such as tuna canning manufacturers or surimi producers usually have fishmeal producers as subsidiary companies in order to dispose of production wastes. Also, some fishmeal producers that use whole fish have their own fishing boats, so unpalatable or degraded fish referred to as “trash fish” are directly sent to these fishmeal producers. And many of them have fishery-related businesses such as seafood brokers, ice producers, or seafood restaurants.

5.1.2 Drivers of the IFFO RS standard adoption

In the case of adopting companies, the most significant driver is the owners' and managers' positive perceptions of the standard. They perceive that the IFFO RS certification is necessary and will become a global trend of fishmeal production in the long run. Therefore, they took this opportunity to obtain the first mover advantage by being the first few producers in Thailand that have adopted the IFFO RS standard. Also, they believe that in the future, regulations will change in a way that will favor or necessitate IFFO RS standard adoption. There is one case that the adoption took place because the owner believed that it was the right thing to do despite the fact that the company receives no financial benefits from the adoption at the moment.

Another driver is customer demands. Three adopters mentioned that their clients – animal feed mills – suggested that they should be certified by the standard. And this is connected to another driver: price premium. They explained that animal feed mills offered a price premium to them in order to persuade them to adopt the standard. The last driver mentioned by the adopters is brand image. The standard makes their fishmeal more attractive to customers than those of non-certified counterparts. In the case of equal prices, customers tend to prefer certified products over non-certified ones. Moreover, the certification can ensure the buyers that there will be no subsequent problems regarding the sources of the fishmeal.

5.1.3 Barriers to the IFFO RS standard adoption

In the case of non-adopters, the most important barrier is type of main raw materials used because only raw materials from sources complying with FAO Code of Conduct for Responsible Fisheries or sources certified by MSC may be used to produce IFFO RS

approved fishmeal. And fisheries in Thai seas are neither certified by MSC nor comply with FAO. Consequently, by-catches cannot be used in IFFO RS certified production. Also, surimi by-products cannot be utilized for the same reason because surimi producers usually obtain their raw materials from Thai seas. Tuna by-products, on the contrary, are eligible to be used because tunas used in tuna canning production are usually imported from MSC certified fisheries (i.e. Western Indian Ocean, Eastern Indian Ocean, and Western Central Pacific). Thus, by-products from these MSC certified tunas are approved by the IFFO RS standard. Aquaculture by-products can be used if they do not come from farms banned because of animal health concerns or show any sign of disease. Therefore, in Table 7, only fishmeal producers using tuna by-products and aquaculture by-products adopted the standard while none of by-catch and surimi by-product users are certified.

Another barrier to the IFFO RS standard adoption is the owners' or managers' perceptions that there is no benefit or it is not necessary to adopt the standard. This is partly because they do not receive benefits as adopters do. So far, buyers that offer a price premium to Thai fishmeal producers for IFFO RS approved fishmeal are animal feed mills. However, not every animal feed mill does. Thus, only companies selling to those animal feed mills will receive financial benefits from the certification. Since customer demand for the standard is non-existent, many interviewees believe that it is not essential for them to adopt it. Moreover, some producers have negative perceptions of an animal feed mill that tries to persuade them to adopt the standard by providing a price premium. These producers mentioned that they did not trust the company, and they were uncertain for how long the firm would continue providing the price premium for IFFO RS approved fishmeal.

Apart from the aforementioned reasons, many non-adopting interviewees do not know the actual requirements for IFFO RS certification, which has affected their decisions regarding the adoption. Several interviewees mentioned that they were informed about the

IFFO RS standard by one animal feed mill that tried to persuade its suppliers to adopt the standard. Many were told by this firm that in order to be certified, they needed to buy a new machine from a company in Denmark which on one hand will improve their production to be more efficient and eco-friendly, but on the other hand, is very expensive. It may be true that the machine can be more efficient and energy-saving, but this is actually unnecessary. Fishmeal producers can still be certified without using it. In fact, some IFFO RS adopters the author interviewed do not use this machine either.

On top of the aforementioned reasons, many non-adopting interviewees also mentioned that they would probably have to pay the costs of factory upgrades and administrative staff hired to handle all the paperwork if they decide to be certified. Thus, these interviewees view the adoption as an unworthy investment. However, this is related to the size of their annual production as well. The fact that large fishmeal producers receive more advantages of the costs of certification per ton than smaller ones may discourage small fishmeal producers from becoming certified. See the costs of IFFO RS certification in Table 8.

Table 8 Cost of IFFO RS certification (using fisheries by-products only)

Details	Cost (GBP)
Administration	
Annual charge/company	2,300.00
Annual charge/factory	250.00
Fisheries By-product Assessment/Species	
Full assessment every 3rd year	250.00
Minor assessment after years 1 & 2	125.00
On Site Audit	
Paid to local auditor every year	455.00
On-site training fee	1,137.00
Total	23,367.00

Source: IFFO RS costs and personal communication

Note: [1] Costs of on-site audit are converted from Thai Baht (THB) to Great Britain Pound (GBP). On-site audit paid to local auditor is 20,000 baht and on-site training fee is 50,000 baht. The exchange rate being used is 1 GBP = 43.96 THB.

[2] Administration and fisheries by-product assessment costs are retrieved from http://www.iffo.net/iffo-rs-costs, and on site audit costs are from personal communication with the certification body.

Table 8 shows that the costs of certification are mostly fixed costs per factory or company, so the more a company can produce the cheaper the costs per unit are. For example, if a fishmeal producer produces 3,000 tons of fishmeal per year, the costs of certification per ton are 7.79 GBP (in the case that all fishmeal is approved by the IFFO RS standard). But if annual production is 10,000 tons, the costs become only 2.34 GBP per ton or about 70% cheaper than those of the fishmeal producer with the annual production of 3,000 tons. The difference in the costs per ton between the two firms will affect their bottom lines differently. These costs exclude other additional fixed costs such as costs for factory renovation, costs of extra administrative staff, or costs of technological upgrades. Hence, smaller companies may be less willing to adopt the standard than the bigger ones because the costs of standard adoption can hurt their profitability substantially compared with those of the larger ones. Therefore, although size itself does not prohibit the fishmeal producers to adopt the IFFO RS standard, the economies of scale can discourage small producers from becoming certified.

Despite the fact that the IFFO RS standard has been adopted by some Thai fishmeal producers in recent years, related government agencies have no scheme to support other fishmeal producers if they want to be certified. When asked if they were interested in adopting the IFFO RS standard, many interviewees had similar responses: even if they were interested, they did not know who they could turn to when they needed advice, and the related governmental agencies themselves (both Department of Fisheries and Department of Livestock Development) did not know about the detailed requirements of the IFFO RS certification.

In addition, some fishmeal producers, particularly small non-adopters, stated that it was difficult for them to find extra workers to conduct day-to-day paperwork. This work will increase because of the document system of the standard which requires the complying firm to be able to trace its raw materials back to their origins. The staff, of course, have to be well-educated and proficient in English because they need to contact the international standard organization. And this type of person who generally has more career options, are unlikely to work for fishmeal producers because of the nature of the business, and the strong, unpleasant fishy smell. And because the companies are small, they can hardly compete on a compensation package with other larger firms. Normally, these fishmeal producers have one or a few clerks to handle all paperwork including bookkeeping. Many of them only have high school diplomas or vocational school diplomas.

5.1.4 Fishmeal producers' perceptions of the IFFO RS standard adoption

From the drivers and barriers to the IFFO RS standard adoption sections, we can see that perceptions of the owners or managers of fishmeal producers can be either driver or barrier to the standard adoption. The adopters tend to have positive perceptions of the IFFO

RS standard considering it as a global trend or a *'right* thing to do' as aforementioned, whereas non-adopters seem to have negative perceptions that it is not necessary for them to adopt the standard because either they do not perceive any benefits from the adoption because of no demand from customers or they believe that the adoption is too expensive and not worth investing their money.

5.2 Results of Part II: Effects of Other Stakeholders

From the results of part I, we have learnt that raw materials that Thai fishmeal producers use prevent many of them from adopting the IFFO RS standard because they are not compliant to the standard. However, even so, it is crucial to understand whether there are any other factors, such as influences from other stakeholders, which can affect Thai fishmeal decision to adopt the standard. Thus, in part II, the author aims to identify how other stakeholders affect Thai fishmeal producers' decision pertaining to the IFFO RS standard adoption. This part begins with an analysis of the IFFO RS requirements which will help us understand whether fishmeal producers need to engage other stakeholders if they want to adopt the standard. And if they do, which stakeholder they need to engage. Then, the findings from the semi-structured interviews with two animal feed mills, one broker, one NGO, and one government agency will be analyzed. The interviews aim to find out how other stakeholders perceive the IFFO RS standard. Finally, this part ends with the analysis of bargaining power in the supply chain.

5.2.1 Stakeholder engagement required for the IFFO RS standard adoption

The IFFO RS standard consists of seven sections with the total requirements of 61. The seven sections include 1) responsible sourcing practices 2) responsible traceability

practices 3) responsible manufacturing practices 4) fish by-products 5) social accountability 6) environmental accountability, and 7) legislative compliance. In these seven sections, there are sub-sections and detailed requirement that an applicant needs to follow in order to apply for the standard. The following table – Table 9 – is the analysis of stakeholder engagement required for the IFFO RS standard adoption, and Table 10 is the summary of number of the IFFO RS requirements needing stakeholder engagement.

Table 9 Analysis of stakeholder engagement required for the IFFO RS standard adoption

Section	Requirements	Fishmeal producer	Supplier	Buyer	Gov.
1	**Responsible sourcing practices**				
1.1	Principles of Responsible Sourcing of Fishery Material				
	In this Standard to comply with the definition of Responsible Sourcing, the Applicant must be able to demonstrate:				
	The responsible sourcing of legal, regulated and reported fishery material and avoidance of material sourced from IUU fishing activity.	o	x	x	x
	Sourcing from fisheries that comply with the key requirements of the FAO Code of Conduct for Responsible Fisheries.	o	o	x	x
1.2	Responsible Sourcing Policy				
1.2.1	Implement a documented policy that commits them to the responsible sourcing of fishery material	o	x	x	x
1.3	Responsible Sourcing of Fishery Raw Material				
1.3.1	The Fishery Management Framework and Procedures				
1.3.1.1	There must be objectives that promote the long-term conservation and sustainable use of fishery resources and ecosystem.	o	x	x	x
1.3.1.2	Fishery management actions must be based on the long-term conservation of the fishery and ecosystem.	o	o	x	o
1.3.1.3	Management must be concerned with the whole stock over its entire distribution and consider all fishery removals and the biology of the species.	o	o	x	o
1.3.1.4	The management of the fishery must include a legal and administrative basis for the implementation of measures and controls to support the conservation of the fishery.	o	o	x	x

Section	Requirements	Fishmeal producer	Supplier	Buyer	Gov.
1.3.1.5	Management procedures and outcomes must be transparent and publically available.	o	x	x	x
1.3.2	Stock Assessment Procedures and Management Advice				
1.3.2.1	There must be scientific information available on the characteristics of the fishery relevant to the long term conservation of the fishery and ecosystem, including; its geographic distribution, stock assessment of target species and where applicable, impact on non target species.	x	x	x	o
1.3.2.2	The conservation and management measures of the fishery must be based on the best scientific information available, concerned with the entire stock, its life-cycle characteristics and geographic distribution.	x	x	x	o
1.3.2.3	Where there is more than one stock management system (e.g. where stocks are distributed across trans-boundaries), there must be sufficient interaction between relevant domestic and international parties to promote compatibility of management objectives for the conservation and sustainable utilisation of the fishery resource.	x	o	x	o
1.3.2.4	Representation must, where applicable include both governmental and non-governmental organisations, concerned with fisheries conservation and management.	x	o	x	o
1.3.3	The Precautionary Principle				
1.3.3.1	The fisheries management framework must apply a precautionary approach to the conservation of the target fishery resource, associated non target species and for the conservation of the wider eco-system.	x	x	x	o
1.3.3.2	Suitable or proxy target and limit reference points must be set and take into account uncertainties relating to size and productivity of the stocks, unknown fishing mortality and the impact of fishing on the environment.	x	x	x	o
1.3.3.3	Precautionary measures must consider (where relevant), discards, dependent species, habitats, communities and threatened, endangered and protected species.	x	x	x	o
1.3.4	Management Measures				
1.3.4.1	The level of fishing permitted must be set according to the scientific information and where available, the recommendation from an officially recognised body.	x	x	x	o
1.3.4.2	There must be adequate control on excess fishing capacity to ensure that it does not prevent the recovery of stocks that are outside of safe biological limits.	x	x	x	o

Section	Requirements	Fishmeal producer	Supplier	Buyer	Gov.
1.3.4.3	Management measures must ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment.	x	x	x	o
1.3.4.4	The fishery must not engage in dynamiting, poisoning and other comparable destructive fishing practices.	o	o	x	o
1.3.4.5	Management must ensure that all vessels under its responsibility including foreign vessels flying their flag are authorised and included in management measures of the fishery.	o	o	x	x
1.3.4.6	There must be a management system for fisheries control and enforcement.	x	x	x	o
1.3.4.7	There must be laws and regulations that provide for sanctions in respect to their violation, (for example where vessels engage in illegal, unregulated and unreported fishing activity).	x	x	x	o
1.3.4.8	There must be evidence of effective fisheries management and control.	x	x	x	o
1.4	Reporting and Recording of Fishery Raw Materials				
1.4.1	Fishery material must be traceable to a fishery (ies) assessed as compliant to the requirements of relevant clauses of the IFFO Standard to be eligible for identification of IFFO compliant.	o	o	x	x
1.4.2	All fishery landings discharged to the Applicant must be recorded and where applicable, must be reported to the official control body according to the legal requirements within the jurisdiction.	o	x	x	x
1.4.3	Fishery material must not be from IUU fishing activity nor sourced from vessels officially listed as engaging in illegal, unreported and unregulated (IUU) fishing activity.	o	x	x	x
1.4.4	The details of each consignment of fish from a vessel must be recorded. This must include: i. Name of vessel, registration number, call sign, legal owner, name and address, ii Proof of authorisation to engage in the specific fishing activity, iii Date and time of discharge to facility, iv Species and quantity discharged, v Location or place(s) and dates of fishing activity where catch originated, vi Fishing method used.	o	o	x	x
1.4.5	A sample of the consignment must be assessed to check its conformity with fishery management rules and statutory requirements.	o	x	x	x
2	**Responsible Traceability Practices**				
2.1	Traceability of Fishmeal to Fishery				

Section	Requirements	Fishmeal producer	Supplier	Buyer	Gov.
2.1.1	Applicants must have a system in place to ensure that the production of compliant fishmeal and fish oil can be traced back to compliant fishery material.	o	x	x	x
2.1.2	Applicants must implement procedures that demonstrate the avoidance of raw materials that are sourced from illegal, Unreported and Unregulated (IUU) fishing activity.	o	x	x	x
2.1.3	Fishmeal and fish oil that meets the requirements of this Standard ("IFFO Assured") must be kept separate and identifiable in order to be eligible for identification as compliant with the IFFO Global Standard for Responsible Supply.	o	x	x	x
2.1.4	Applicants must implement a system adequate to ensure positive batch identification.	o	x	x	x
2.1.5	Where the identity of eligible material is lost, (e.g. through mixing with ineligible material) or there is a potential loss in identity through loss in traceability, the subsequent batch must no longer be identified as compliant with the IFFO Global Standard for Responsible Supply.	o	x	x	x
2.1.6	Applicants must test the efficiency of their batch control and traceability systems through a thorough documented internal audit conducted no less than once per annum for both fishmeal and fish oil.	o	x	x	x
2.1.7	This must include:				
2.1.7.1	Traceability of fishery material supply - Supplier Traceability.	o	o	x	x
2.1.7.2	Traceability of raw fishery material to finished product as it moves through processing and all storage stages (including external and third party storage) - Process Traceability	o	x	x	x
2.1.7.3	Traceability of certified compliant fishmeal and fish oil to immediate customers - Customer Traceability.	o	x	o	x
2.1.7.4	The outcome of internal traceability audits must be documented including, evidence of performance through compliance reports, non conformances, corrective and verification actions.	o	x	x	x
2.1.8	Applicants must inform the Certification Body in the event of a recall of certified material.	o	x	x	x
2.2	Record Keeping				
2.2.1	Applicants must ensure that all records required by this standard are kept for a minimum of three years.	o	x	x	x
2.2.2	Records must be accurate, legible and unadulterated.	o	x	x	x
3	**Responsible Manufacturing Practices**				
3.1	Certification to IFIS				

Section	Requirements	Fishmeal producer	Supplier	Buyer	Gov.
3.1.1	Applicants must demonstrate Responsible Manufacturing Practices by achieving certification to the International Feed Safety Alliance (IFSA) Feed Ingredient Standard.	o	x	x	x
3.1.2	Certification must be administered by an ISO Guide 65 accredited Certification Body and the IFSA programme included in the scope by a member of the IAF Multilateral Agreement (MLA).	o	x	x	x
3.1.3	Current and valid certificates must be available for each site registered on the IFFO Application Form.	o	x	x	x
3.1.4	The outcome of external inspection and surveillance audits to the IFIS Standard must be made available including; reports of the performance, outcome, non conformances and coercive actions associated with assessments conducted by the appointed Certification Body.	o	x	x	x
4	**Fish By – Products**				
4.1	Raw Fishery Materials from Fish Processing				
4.1.1	The fish by-product must come from fish that is intended for Human consumption. The applicant must have a document policy stating this.	o	x	x	x
4.1.2	The fish by-product must meet and be handled according to the requirements of the IFIS or equivalent certification programme, which include: no contamination with Land Animal Protein (LAP), chemical biological or physical agents	o	x	x	x
4.1.3	The fish by-product must not knowingly be from illegal, unreported and unregulated fishing activity.	o	x	x	x
4.1.4	The Applicant must be able to trace the origin of material back to the supplying fish processor or handler and by species or mix of species included in the receiving batches.	o	o	x	x
4.1.5	The fish by-product must not come from a species listed under the following categories on the IUCN Red list (www.IUCN.ORG) - Extinct - Critically Endangered - Endangered	o	o	x	x
4.1.6	Species that are listed as vulnerable are eligible for use as by-product; however an exception exists for fisheries from a discrete sub population if they have a fishery management plan that continually evaluates the stock relative to fishing and adjusts/controls harvests according to changes in the status of the stock, and are compliant to FAO Code of Conduct for Responsible Fisheries.	o	o	x	x

Section	Requirements	Fishmeal producer	Supplier	Buyer	Gov.
4.1.7	Regardless of all the IUCN listing, each by-product will also be subject to assessment which will be based on the following criteria: That evidence does not exist that the by-product is caught from - IUU activity - by destructive fishing practices, - is fished such that it causes irreversible impact to the fishery stock and/or aquatic ecosystem.	o	o	x	x
4.2	Raw Fishery Materials from Aquaculture				
4.2.1	They must show no clinical signs of disease on the day of receipt (EU Reg 1774/2002).	o	x	x	x
4.2.2	They must not come from a farm which is subject to a prohibition for animal health reasons and must not have been in contact with animals from such a farm.	o	x	x	x
4.2.3	They must be kept segregated and clearly labelled as fishmeal and fish oil of the species that they originate from including circumstances where they are mixed with other raw materials both before and post processing (EU Reg 811/2003).	o	x	x	x
5	**Social Accountability**				
5.1	The applicant must have a documented policy that commits them to ensuring that their fishmeal and fish oil products are manufactured in compliance to all relevant employment, welfare and safety legislation.	o	x	x	x
5.2	The applicant must conduct a document annual self-assessment against all relevant social laws. All non-compliance must be documented, with action plans to address and monitor the non-compliance.	o	x	x	x
6	**Environmental Accountability**				
6.1	The applicant to the IFFO RS standard must have a documented policy that commits them to ensuring that their fishmeal and fish oil products are manufactured in compliance to all relevant environmental regulations.	o	x	x	x
6.2	The applicant must provide evidence that they comply with all relevant regulations for effluent and emission discharges.	o	x	x	x
6.3	Areas for improvements that have been identified must be accompanied by an action plan that is approved by the national regulatory authorities.	o	x	x	x
7	**Legislative Compliance**				
7.1	The applicant must maintain compliance with all relevant social and environmental legislation for the past 12 months.	o	x	x	x

Table 10 Summary of number of the IFFO RS requirements needing stakeholder engagement

Section (total no. of requirements)	Fishmeal producer	Supplier	Buyer	Gov.
1. Responsible sourcing practices (28)	15	10	0	16
2. Responsible Traceability Practices (13)	13	1	1	0
3. Responsible Manufacturing Practices (4)	4	0	0	0
4. Fish By – Products (10)	10	4	0	0
5. Social Accountability (2)	2	0	0	0
6. Environmental Accountability (3)	3	0	0	0
7. Legislative Compliance (1)	1	0	0	0

From Table 10, we can see that the fishmeal producer – an adopter of the IFFO RS standard – is the main actor required to take action in all the seven sections, especially section 2 to section 7 in which every requirement needs fishmeal producer's action. Section 1, 2, and 4 are only sections that require other stakeholders' engagement, particularly section 1. Therefore, from the analysis of the IFFO RS requirements, we can conclude that to adopt the IFFO RS standard, a fishmeal producer needs collaboration from other stakeholders.

5.2.2 Other stakeholders' perceptions of the IFFO RS standard

In this section, the findings of semi-structured, in-depth interviews with other stakeholders – two animal feed mills, one broker, one NGO, and one government agency – are analyzed. The two animal feed mills and the broker were solicited opinions on the IFFO RS standard adoption as they are buyers of fishmeal, whereas the NGO was asked to see if it

thinks the IFFO RS standard will help solve the problems in the fishmeal supply chain. And lastly, the government agency – the Department of Fisheries – as the regulator was questioned about the IFFO RS standard as a means to solve the problems in the fishmeal supply chain.

5.2.2.1 Animal feed mill A

Animal feed mill A is part of one of the largest food conglomerate in Thailand of which the parent owns farms, processing and packaging plants, and carries its own retail brands which are sold domestically and internationally. It was often referred to as the largest fishmeal buyer in Thailand which used to buy up to 40-50%. This animal feed mill used to have 55 suppliers before it changed its purchasing criteria which states that it buys IFFO RS approved fishmeal only after it was sued by a consumer in the U.S. for using slave-labor fishmeal. Therefore, it bought from only one fishmeal producer in Thailand that adopted the IFFO RS standard under that chain of custody. However, the company imported fishmeal from its subsidiary and other fishmeal producers in Vietnam. Even though animal feed mill A bought from only one fishmeal producer, it still worked with ten suppliers to help support them so that they could improve their operations and be able to adopt the standard.

The main reasons for animal feed mill A to buy only IFFO RS approved fishmeal are to increase credibility of the company among its international buyers and to avoid criticism from local NGOs because the company was criticized heavily for using fishmeal sourced from unsustainable supplies. Although Thailand has the fishmeal certificate scheme which is the local traceability program for fishmeal producers, and in which animal feed mill A also participated, animal feed mill A viewed that this program had problems with credibility because it was verified by the Department of Fisheries. No third-party organization was

involved in the program. A major concern of animal feed mill A is the fact that the IFFO RS standard is based on laws and regulations of each country, and the IFFO RS standard cannot solve all problems in the fishmeal supply chain.

5.2.2.2 Animal feed mill B

Animal feed mill B is also part of one of the largest seafood conglomerate in Thailand. Like the parent company of animal feed mill A, the parent company of animal feed mill B owns farms, processing and packaging plants, and it also has its own retail brands that are exported and sold in Thailand. Currently animal feed mill B had seven local fishmeal suppliers. The company had a policy which states that it will buy IFFO RS approved fishmeal only for fishmeal produced from fish by-products, and in case of fishmeal made from whole fish, the supplier has to provide traceability document verified by the Department of Fisheries.

The main reason that animal feed mill B had no intention to force its suppliers to adopt IFFO RS standard yet is because its clients do not need it. Also, TFM has been working closely with its buyers by having them come to inspect its supply chain, so now its clients are satisfied with it. The major concern of company B is that under the current requirements of the IFFO RS standard, none of fishmeal producers using whole fish as their main raw materials could not adopt the standard.

5.2.2.3 Broker

This broker is also a fishmeal producer. It receives a vast majority of its raw materials – fish by-products – from surimi producers while the rest from fish canning manufacturers. It

exports fishmeal to China, India and Japan. It not only exported its own products but also bought fishmeal from other fishmeal producers to export.

The main reason that this broker thinks that the IFFO RS standard is not necessary is because its export clients in China and Japan do not require this standard. It believes that main clients in China would not demand Thai fishmeal producers to adopt this standard soon. The main concern for this broker is that the IFFO RS standard is expensive, so it will be more suitable with a large fishmeal producer. Another concern is that the IFFO RS standard does not have a requirement for multi-species fisheries which are the local fishery context of Thailand. Therefore, fishmeal producers using by-products from surimi producers and fish-canning manufacturers could not adopt the standard because these producers use fish caught from Thai seas as their raw materials.

5.2.2.4 NGO

This NGO works with artisanal fishing communities in the southern part of Thailand. And these artisanal fishing communities are said to be vulnerable by unsustainable fishing practices. Thus, this NGO has been advocated for sustainable fisheries to conserve marine ecosystem so that it will not affect the livelihood of artisanal fishermen. It works with private sectors such animal feed industry and fishmeal industry, and the government agency to promote the sustainable fishmeal supply chain.

The NGO had no comments about this standard because it did not know much about the IFFO RS standard. However, it would accept this standard if it allowed stakeholders to participate and comment on the standard. The main concern of this NGO is that because the IFFO RS standard is based on the local laws and regulations, and in many cases, legal fishing

practices do not mean sustainable practices. For example, trawling is still a legal practice even though many pieces of scientific research show that it can damage marine ecosystem.

5.2.2.5 The Department of Fisheries

In fact, DoF is not directly in charge of fishmeal producers, but because DoF takes care of fishery production (raw materials of fishmeal) and shrimp farming (end users of fishmeal), DoF eventually has to deal with problems in the fishmeal supply chain. Currently, DoF has its own fishmeal traceability scheme, and the new fisheries act enacted last year orders that every fishery product including fishmeal that will be exported has to have traceability document. Otherwise, if it is found out later that it was exported without a traceability document, the exporter will be fined 5 times of values of the goods. Therefore, now many fishmeal producers participate in the fishmeal certificate scheme to get fishmeal certificates, and DoF aims to have all the fishmeal producers to participate in the scheme.

DoF believes that the IFFO RS standard will be beneficial for Thai fishmeal industry and Thai shrimp supply chain. But the main concern of DoF is that this standard is voluntary, and it needs a large amount of investment and knowledgeable personnel. Thus, it is not suitable for every fishmeal producer. As a government agency, DoF has to support every producer ensuring that everyone can be in the system.

5.2.3 Bargaining power and pressure for the IFFO RS standard in the fishmeal supply chain

From the 5.2.1 section, it is clear that to adopt the IFFO RS standard, a fishmeal producer needs collaboration from other stakeholders in the supply chain. And the 5.2.2 section shows that only one animal feed mill requires the IFFO RS standard while the other animal feed mill and broker view it as unnecessary. NGO is not sure whether the standard can

actually solve the problems in the supply chain, whereas the DoF considers it to be beneficial, but not for every fishmeal producer; therefore, they do not demand for the IFFO RS standard. Therefore, we can see that there is relative low pressure on Thai fishmeal producers for the IFFO RS standard adoption from other stakeholders except those supplying fishmeal to animal feed mill A that requires the IFFO RS standard.

Also, if we look at Figure 22 adapted from Figure 2, we will see that from 2005 to 2012, domestic consumption was the main market for fishmeal produced in Thailand. However, from 2013 to 2015, exports have become increasingly significant markets for fishmeal producers. This is partly because CPF which used to buy up to 40-50% of fishmeal produced in Thailand has stopped buying non-IFFO RS approved fishmeal, and bought fishmeal from one fishmeal producer in Thailand. Thus the former fishmeal suppliers of CPF had to find other markets for their products, and many of them turned to brokers as discussed in chapter 2. This means brokers have had more bargaining power over fishmeal producers. And when we look at Figure 15, we will see that top five export destinations in 2015 were Asian countries accounting about 93% of total exported fishmeal, and none of Asian countries requires IFFO RS. Therefore, we can infer that there is no demand for IFFO RS standard from brokers.

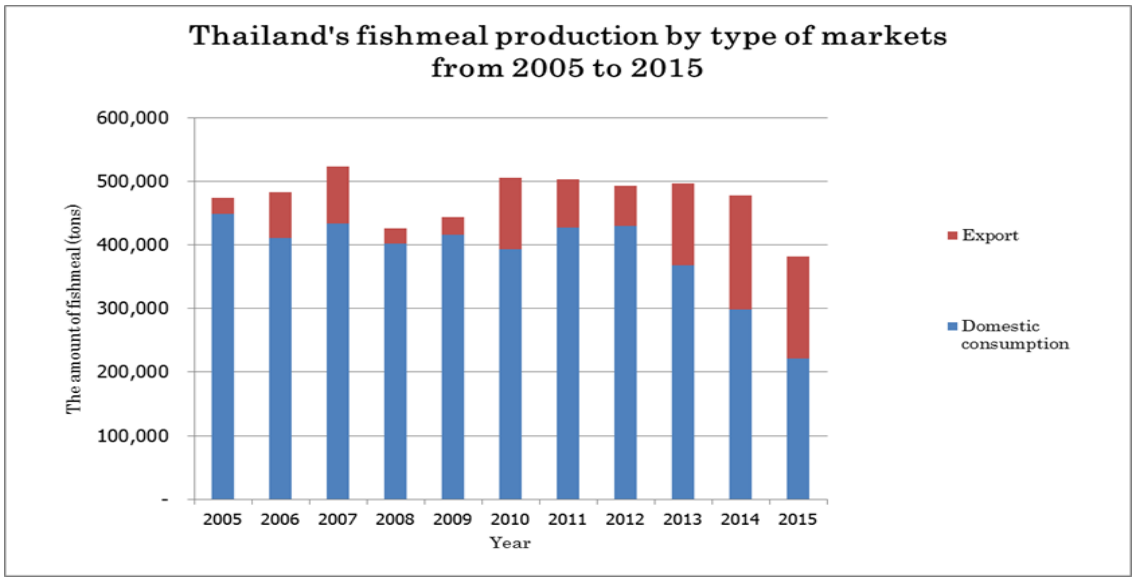

Figure 21 Thai fishmeal production by markets 2005 to 2015. Adapted from Presentation at Rama Garden Hotel by Akaravarinechai, 2012, Retrieved April 8, 2016, from http://www.thaichamber.org/userfiles/file/6(1).pdf; and *Fishmeal Production from B.E. 2553 – 2558*, by TFPA, 2016, via personal communication; and *Fisheries Statistics of Thailand B.E. 2548 - 2557*, by Fishery Statistics Analysis and Research Group, Fishery Information Technology Center, the Department of Fisheries, 2005 -2014, Retrieved April 8, 2016, from http://www.fisheries.go.th/it-stat/; and *List of fishmeal producers certified and not certified by GMP and HACCP*, by TFPA, 2015, via personal communication

CHAPTER 6

DISCUSSION

From the previous chapter, this study has shown that the main barrier that prevents many fishmeal producers from adopting the IFFO RS standard is the type of raw materials they use (part I), whereas to adopt the standard needs collaboration from other stakeholders, and many stakeholders perceive that this standard is unnecessary (part II). To sum up, there are limitations on the supply side while there is very low demand on the demand side. That is why only a few fishmeal producers have adopted this standard even though an animal feed mill offers price premium for the IFFO RS approved fishmeal. The following sections will discuss important points of the finding analysis.

6.1 Implications from the Results of Part I

To identify the factors that influence Thai fishmeal producers to adopt the IFFO RS standard, this part investigates three questions: 1) what are the drivers that will encourage them to adopt the standard?, 2) what are the barriers they are experiencing that prevent them from adopting the standard?, and 3) what are the perceptions of the owners/managers of fishmeal producers. This is to understand why only providing a financial incentive is insufficient to encourage them to adopt the IFFO RS standard. And the findings from part I have several points to discuss.

First, literature about barriers and benefits/drivers to the adoption of third-party certification standards has seldom considered which factor, between barriers and

benefits/drivers, is more influential (Fischer et al., 2005; Hatanaka et al., 2005; Goyert et al., 2010; Perez-Ramirez et al., 2012a; 2012b; Qijun & Batt, 2016). However, in this study, we found that the most important barrier – type of raw materials used – is more critical to the adoption than any driver. This is because without raw materials that comply, fishmeal producers cannot adopt this standard regardless of what and how many drivers are provided. Thus, the fact that one animal feed mill tries to persuade fishmeal producers to acquire the IFFO RS standard certification by providing a price premium for IFFO RS approved fishmeal is less likely to make them do so. They may be successful with fishmeal producers who already use eligible raw materials, but the question is how many fishmeal producers use such inputs for their productions. From figure 9 in the chapter 2 showing the amount of raw materials of fishmeal by type between 2012 and 2015, we can see that in 2015 whole fish accounted more than 50% of the total raw materials, whereas tuna by-products portion was less than 20%. Aqua-culture by-products were included in the portion of by-products from fish processors, but the percentage was unknown. Consequently, under the current circumstance, only a small portion of raw materials can be used to produce IFFO RS approved fishmeal. Please note that not all tuna by-products are approved by the IFFO RS standard. Only those from MSC certified tuna are, and the percentage of such by-products is unknown, so the amount of eligible raw materials is likely less.

Therefore, if the government or buyers of the fishmeal producers want to promote IFFO RS standard adoption, helping the producers overcome this barrier is more critical than providing incentives. This means that the Thai government has to manage and conserve Thai fisheries more efficiently and transparently, and emphasizes the environmental responsibility of all stakeholders in order to prevent overfishing and IUU fisheries. Moreover, the government should have a monitoring system to ensure compliance. Also, in order to improve fisheries management and conservation, scientific data on fish stock as well as

characteristics of Thai fisheries are needed (This will be discussed more in the next chapter in the policy recommendation section). This will not only help make Thai fisheries comply with the Code of FAO, but it will also be beneficial to the Thai fishery industry and Thai marine ecosystem in the long run.

However, the feasibility of this suggestion is still questionable because Thai fisheries are mixed fisheries where many species of fish are caught together by the same fishing gear at the same time. Thus, it is very difficult to assess each species of caught fish individually. The collaboration between Thai government and IFFO is needed to find solutions for this limitation. Also, when we consider the findings of this study, they show that related governmental agencies of Thailand have not supported Thai fishmeal producers to adopt the IFFO RS standard. In fact, they do not seem to know the details of the standard, let alone giving advice or support. They leave it to one animal feed mill to tell, persuade, and advise the fishmeal producers to adopt the IFFO RS standard. But the problem is the information the firm has given to these fishmeal producers is partly inaccurate which can lead to misunderstanding and negative perceptions of the standard adoption.

A possible reason that causes the governmental agencies to not see the significance of the standard is probably that it is a voluntary, private standard. Thailand already has its own fishmeal certification scheme. This scheme is the document traceability system of fishmeal productions in the country. However, this scheme differs from the IFFO RS standard in some aspects. First, it is neither verified nor assessed by any third-party organization. It is a self-report scheme validated by the Department of Fisheries. Second, the Department of Fisheries only checks whether the data in the submitted documents match the data in its database; there is no on-site audit. Therefore, the credibility of the scheme among buyers, especially international ones, is questionable.

Second, the findings show that the owners' and managers' perceptions of the importance of the standard are an important factor that can drive or limit the standard adoption. And this is in line with literature on executive perceptions toward environmental standard adoption which has stated that managerial perception regarding the potential of initiatives contributes to the eco-friendly culture of the company and new technology adoptions (Harris & Crane, 2002 and Dvir et al., 1993 cited in Michael et al. 2010). Also, the adoption of green programs depends on the managerial perception of potential of the programs (Michael et al., 2010). Nonetheless, the impact of executive perceptions on the standard adoption is barely discussed in literature concerning barriers and benefits/drivers to the adoption of third-party certification standards as one influencing factor. Rather, they have focused more on market benefits, and financial and institutional barriers (Fischer et al., 2005; Hatanaka et al., 2005; Goyert et al., 2010; Perez-Ramirez et al., 2012a; 2012b; Qijun & Batt, 2016).

Third, in the literature on third-party certification standards, one barrier is financial resources needed for the certification, especially the costs of certification which include pre-assessment costs, annual audit costs, annual license fees, and levies (Hatanaka et al., 2005; Ponte, 2006; Goyert et al., 2010; Perez-Ramirez et al., 2012a). However, in this study, the author found that most fishmeal producers interviewed can afford the costs, but they feel that the costs are too high and not worth investing in when considering the price premium they will receive. Since the information they receive is inaccurate as explained in the results part, it is difficult to tell if the costs are a barrier to the adoption or not.

6.2 Implications from the Results of Part II

From the results of part II, we learn that factors affecting the IFFO RS standard adoption exist beyond business operations, and collaboration among various stakeholders is necessary for the adoption of the standard. This highlights the importance of other stakeholders and underlines the fact that to solve problems in the supply chain requires collaboration among the chain members – not just those whose operations have problems. In case of Thai fishmeal supply chain in this study, it is obvious that problems actually take place in fisheries industry, whereas the pressure on fishmeal producers to adopt a sustainability standard comes the EU and US markets which are downstream players. However, although there is pressure from the EU and US markets, only a few Thai fishmeal producers feel the pressure and adopt the IFFO RS standard because the rest has other channels to sell their products which do not require any standard from them. Part of the reasons may be because these fishmeal producers cannot adopt the standard because of the raw materials they use. Nonetheless, many of them stated that their clients did not need the standard as shown in the results of part I. Therefore, to encourage the IFFO RS standard adoption, benefits of all the stakeholders should be considered, and responsibility of each stakeholder should be emphasized to increase the tendency of their collaboration.

However, more standard adoptions among the fishmeal producers do not necessarily mean all the problems solved nor, and being certified is not the only option for fishmeal producers to deal with the problems about their raw materials (alternatives to the standard adoption will be discussed in the next chapter in the policy recommendation section) Collaboration among all the stakeholders is also crucial to solving the problems in the supply chain, not just to encourage more adoptions among Thai fishmeal producer, because it is likely that fishmeal producers will need both money and knowledge in order to do so. Therefore, other stakeholders which will also get benefits from the problems being fixed –

either in terms of brand image or quality of products – should share the costs of problem solving and/or support them on know-how.

The next discussion point of this part is the suitability of the IFFO RS standard. The findings also illustrate that the IFFO RS standard which is an international standard does not fit the local context of Thai fisheries which are mixed fisheries. This is a typical limitation of third-party certification standards created by western organizations, and probably because of this reason, more producers from developed countries adopt the IFFO RS standard than those from developing nations as discussed in the chapter 3. Therefore, the Thai government along with stakeholders in the supply chain need to discuss and work with the IFFO to find possible solutions for the limitations so that more Thai fishmeal producers adopt the standard.

For supply chain managers of animal feed mills that would like to promote the IFFO RS standard adoption among their suppliers to improve their chains, this study gives insights on how to motivate fishmeal producers apart from providing financial incentives to them. A collaboration between their companies and their suppliers is needed as well as a cooperation between these suppliers and their own partners, so they cannot only focus on their direct suppliers as Chen and Paulraj (2004) cited in Gold et al. (2009) point out that companies are links in supply chains. Therefore, their performance relies on the effectiveness and efficiency of their cooperation with their direct partners as well as the cooperation between these partners and their own partners. And in this case, the situation is rather complex because it involves many stakeholders (fishmeal producers, fishing boats, the Department of Fisheries, importers, consumers etc.) and activities, clear understandings and collaboration between animal feed mills and their partners can help encourage their suppliers to adopt the IFFO RS standard and possibly enhance the overall sustainability performance of the whole supply chains.

CHAPTER 7

CONCLUSION AND POLICY RECOMMENDATIONS

7.1 Conclusion

From the case study of the factors that influence Thai fishmeal producers to adopt or not to adopt the IFFO RS standard, the results from part I show that the drivers of the adoption are 1) the owners' or managers' positive perceptions of the standard, 2) customer demands, 3) a price premium, and 4) brand image. And there are six barriers to the adoption namely 1) type of main raw materials, 2) the owners' or managers' negative perceptions of the standard, 3) the owners' or managers' lack of knowledge about the standard, 4) size of fishmeal producers, 5) lack of support from the government, and 6) administrative incapacity. However, the author concludes that the type of main raw materials that the fishmeal producers use is the most influential factor that prevents many of them from adopting the IFFO RS standard. However, the author concludes that the type of main raw materials that the fishmeal producers use is the most influential factor that prevents many of them from adopting the IFFO RS standard. This is because without raw materials from sources compliant to the standard, fishmeal producers cannot produce IFFO RS approved fishmeal. And no Thai fisheries comply with the IFFO RS standard, so fish from these sources are not certifiable.

The results from part II show that factors affecting the IFFO RS standard adoption exist beyond business operations. The IFFO RS Standard needs collaboration from suppliers, buyers and the government while most of these other stakeholders who were interviewed perceive that the IFFO RS standard is unnecessary or not suitable for fishmeal producers in

Thailand. Therefore, when we look at the demands for the IFFO RS standard, it is limited to only fishmeal producers supplying their products to animal feed mills which sell their products to farms aiming to export their products to the EU and US markets. In turn, fishmeal producers supply to brokers or animal feed mills that have final customers in non-EU&US markets are not demanded for the IFFO RS standard adoption. This answers the research questions at the beginning of the thesis "why did only two fishmeal producers adopt the IFFO RS standard at that time?" and "why do other fishmeal producers not adopt the standard despite the price premium offered to them?" This is because on the supply side, compliant raw materials are limited, whereas no demand from customers except those from the EU and US markets. Hence, solely providing financial incentives such as a price premium to Thai fishmeal producers is insufficient to encourage them to adopt the IFFO RS standard.

7.2 Policy Recommendations

In this section, the author gives suggestions on how policymakers and stakeholders can overcome the barriers and promote the IFFO RS standard adoption among Thai fishmeal producers as well as improve the situations in the fishmeal supply chain to be more sustainable based on findings of this study. The recommendations are divided into two parts according to two objectives of the recommendations, and the two objectives were created to achieve the ultimate goal of this study: "Thailand can improve practices of members in the fishmeal supply chain to reduce and eliminate unsustainable activities as well as upgrade the chain."

The author believes that to achieve such a goal, increasing the number of Thai fishmeal producers adopting the IFFO RS standard is not the only option we have. Consequently, in the following recommendations, the first part is recommendations which

aim to promote the IFFO RS standard adoption while the second part is to provide an alternative to the standard adoption. The audience of each recommendation is specified as the author provides recommendations for other stakeholders, too, not just the policy makers.

7.2.1 Policy recommendations to promote the IFFO RS standard adoption

7.2.1.1 Recommendations for policymakers

- Collaborate with the IFFO to improve requirements of IFFO RS in a way that can be applied to fishmeal industries in the countries where fishery contexts are different from those of western regions. The standard should continue discourage the use of unsustainable and irresponsible supplies of raw materials such as juvenile fish caught by trawlers using very fine mesh size nets at spawning grounds. However, in case of fish caught responsibly, they should be allowed to use in the IFFO RS approved fishmeal production.
- Monitor and enforce the laws consistently on fishing boats to prevent and discourage IUU fishing which creates negative impacts on marine ecosystem, and fish from IUU fisheries are non-compliant raw materials which cannot be used by the IFFO RS certified fishmeal producers.
- Promote and support the International Feed Ingredients Standard certification among fishmeal producers since it is a requirement of the standard, and it will improve the operations of fishmeal producers as well. However, currently many fishmeal producers do not know what to do or whom to consult when they want to become certified.
- Work with the IFFO RS certifying body to disseminate knowledge to fishmeal producers on how to become the IFFO RS certified fishmeal producers so that

fishmeal producers can make a decision whether or not they will adopt the standard based on accurate information.

- Collaborate with private sectors such as fishery industry, fishmeal industry and animal feed industry to create general understandings about the benefits of standard adopt and importance of sustainable supply chains.

7.2.1.2 Recommendations for fishmeal producers

- In case of small to medium producers, consolidating with each other in the same area to form a larger enterprise can result in larger and more stable pool of raw materials which can lead to more efficiency in the productions. Moreover, consolidation will increase the number of assets and size of the capital which they can use to invest in factory upgrades or business expansion. Besides, it will reduce some administrative costs and costs of IFFO RS adoption because many costs are fixed costs per company.
- Form a pilot group or work under the name of TFPA with the Department of Fisheries or other related government agencies to promote and support the International Feed Ingredients Standard certification for fishmeal producers which are interested to be certified. After this pilot group become certified, members in this group can be mentors for other fishmeal producers that want to adopt the standard.
- Thai fishmeal producers that want to adopt the IFFO RS standard should form a group or TFPA can hold a seminar, and then invite a certifying body of IFFO RS to share the information about how fishmeal producers should do if they would like to adopt the standard.

7.2.1.3 Recommendations for animal feed mills

- Animal feed mills that would like to encourage their fishmeal suppliers to adopt the IFFO RS standard should support their partners by helping them upgrade their operations and documentation systems as well as sharing the costs of the adoption – probably in a form of price premiums.
- Work with other animal feed mill, ensure that they understand how IFFO RS standard is important to the animal feed industry, and encourage them to use IFFO RS standard as purchasing criteria in order to limit markets for non-certified fishmeal and influence their fishmeal suppliers to adopt the IFFO RS standard.

7.2.1.4 Recommendations for the IFFO

- Revise and update the requirements of the IFFO RS standard so that the standard can be adopted by fishmeal producers in the countries where fishery contexts are different from those of western regions. From Table 19, we can see that the majority of IFFO RS approved fishmeal were produced from developed countries. And there were only two Asian countries that adopt the standard which are Thailand and Vietnam. This can probably infer that the IFFO RS standard does not fit with fishery contexts of Asian or developing countries.

7.2.2 Policy recommendations to provide alternatives to the IFFO RS standard adoption

7.2.2.1 Recommendations for policymakers

- Promote and support the International Feed Ingredients Standard certification among fishmeal producers. Even though fishmeal producers that do not wish to adopt the IFFO RS standard do not need to become certified, the International Feed Ingredients

Standard will improve the operations of fishmeal producers and the quality of fishmeal. This will increase the overall standard in the fishmeal industry. Moreover, this will be useful in case that in the future fishmeal producers want to adopt the IFFO RS standard.

- Monitor and enforce the laws consistently on fishing boats to prevent and discourage IUU fishing which creates negative impacts on marine ecosystem.
- Collaborate with private sectors such as fishery industry, fishmeal industry and animal feed industry to create general understandings about the benefits and importance of sustainable supply chains. Thai fishmeal supply chain can get economic benefits from markets if they can prove that their products produced from a sustainable supply chain.
- Improve the transparency and efficiency of the process of the Department of Fisheries' fishmeal certificate scheme by working with third party organizations to verify traceability documents submitted by fishmeal producers.
- Collaborate with private sectors, NGOs and civil society to create a local fishmeal standard. This standard should be transparent and engage all stakeholders in every process of developing the standard.

7.2.2.2 Recommendations for fishmeal producers

- In case of small to medium producers, consolidating with each other in the same area to form a larger enterprise can result in larger and more stable pool of raw materials which can lead to more efficiency in the productions. This can create competitive advantages for them as raw materials are essential resources for fishmeal producers. In addition, consolidation will increase the number of assets and size of the capital

which they can use to invest in factory upgrades or business expansion. Even though fishmeal producers may not wish to adopt the IFFO RS standard, consolidation will reduce some administrative costs which in turn will increase the bottom line for the company.

- Form a pilot group or work under the name of TFPA with the Department of Fisheries or other related government agencies to promote and support the International Feed Ingredients Standard certification for fishmeal producers which are interested to be certified. After this pilot group become certified, members in this group can be mentors for other fishmeal producers that want to adopt the standard. This standard is useful for fishmeal producers regardless of their standard adoption decision because it will improve the operations and quality of fishmeal and increase their credibility among their buyers.
- Work with partners including fishing boats, animal feed mills, brokers and the Department of Fisheries to improve the fishmeal certificate scheme to be more transparent so as to increase the credibility of the scheme.
- Work with suppliers and educate them about the importance of becoming a sustainable supply chain and the significance of their roles on the path toward a sustainable supply chain. Explicitly inform them what kind of raw materials are expected or unacceptable. Every fishmeal producer should have a relatively similar standard for what acceptable raw materials are in order to force suppliers to comply accordingly. Otherwise, suppliers may not comply and turn to fishmeal producers with a lower standard for acceptable raw materials.

7.2.2.3 Recommendations for animal feed mills

- Even though not all fishmeal producers can adopt the IFFO RS standard, it is still useful for animal feed mills to support them to improve their traceability, operation and documentation systems. This can result in higher quality fishmeal and better communication across the supply chain.

7.2.2.4 Recommendations for NGOs

- Collaborate with stakeholders in the fishmeal supply chain – not only monitor or create advocacy against them. For fishmeal producers and fishery businesses, NGOs should work with them and try to find possible and mutually acceptable solutions together. For animal feed mills and retailers, NGOs can point out their roles and responsibility to provide sustainably sourced products to consumers, and support them to work with their own fishmeal partners to achieve a sustainable supply chain. When they successfully make their supply chain sustainable, NGOs can help endorse their products to encourage them to keep their good practices.
- Educate consumers about problems in the fishmeal supply chain to create public awareness that they are also part of the problems because they are part of the supply chain. Hopefully educated consumers will pressure related companies through their choice of purchases.

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APPENDIX

Interview questions

Stakeholders	Objectives	Questions
Fishmeal producers	**General questions**	
	Acquire their basic information	a. What type of FM production system do you have? b. How old is the plant? c. What is your production capacity? d. How much could your company produce on average per month last year? e. What grade? f. What kind of raw materials do you use? What is the ratio? g. Where do you get them? Do you have your own fishing boat? h. Who are your customers? What is the ratio? Do they need traceability documents? What documents do they want? Can you provide? i. What is your company structure? j. What is the company's policy on sustainability?
	Specific questions	
	1. Identify factors that **influence** them to participate in *FM certificate scheme* + weight	1.1 Do you participate in FM certificate scheme? If yes, for how long? If they just participated, why did you just participate? If no, what would encourage you to participate? Then move to 2.1. 1.2 How many % of FM you produce have FM certificate? If not 100%, why not? 1.3 Whom do you sell FM with FM certificate to? What about FM without FM certificate? 1.4 Why do you participate in FM certificate scheme? 1.5 What factors do you think will help influence other FM producers to participate in FM certificate scheme? Then move to 2.2.
	2. Identify factors that **hinder** them to participate in *FM certificate scheme* + weight	2.1 Why do you not participate in FM certificate scheme? 2.2 Do you have any problem when you tried to participate in the scheme or not? (For those who participate)

Stakeholders	Objectives	Questions
		2.3 What factors do you think have hindered other FM producers from participating in FM certificate scheme?
	3. Examine their perception on *FM certificate scheme*	3.1 What do you think about FM certificate scheme? 3.2 Do you get any benefits from participating in FM certificate scheme? (For those who participate) 3.3 What do you think are pros and cons of the scheme? 3.4 Do you think if it is effective? 3.5 How do you think it can be improved?
	4. Examine their perception on *IFFO RS standard*	4.1 What do you think about IFFO RS standard? 4.2 What do you think are pros and cons of IFFO RS?
	4. Identify factors that **hinder** them to adopt *IFFO RS standard* + weight	5.1 Why do you not adopt IFFO RS standard? 5.2 Will you adopt it in the future? If yes, when? 5.3 Are you interested in participating in IFFO RS Improvers' Programme? 5.4 What factors do you think have hindered other FM producers from adopting IFFO RS standard?
	5. Identify factors that **influence** them to adopt *IFFO RS standard* + weight	6.1 What factors will influence you to adopt IFFO RS standard? 6.2 What do you think about that CPF only buys IFFO RS certified FM?
Thai Fishmeal Producers Association	**General questions**	
	Examine how the current situation in FM industry affects FM producers and their decision to participate in FM certificate scheme and adopt IFFO RS standard	a. What is the current situation of raw materials of FM producers? b. What do FM producers do as a countermeasure for the problem? c. What about that CPF only buys IFFO RS certified FM? How do FM producers handle this situation? How long do you think CPF will do this? d. Do they have any other problems? e. What about the export? How many tons did you export last year? How many do you expect to export this year? f. How do FM producers view sustainability? g. Despite the poor quality of trash fish, why do you think FM producers still buy them?
	Specific questions	
	1. Examine their perception on *FM certificate scheme*	1.1 What do you think about FM certificate scheme? 1.2 What do you think are pros and cons of FM certificate scheme?

Stakeholders	Objectives	Questions
		1.3 How do you think it can be improved? 1.4 Do you think if all FM producers participate in FM certificate scheme or adopt IFFO RS standard, will it solve bottom trawling problem?
	2. Identify factors that **influence** FM producers to participate in *FM certificate scheme* + weight	2.1 How many FM producers can participate in FM certificate scheme so far? 2.2 What factors do you think influence other FM producers to participate in FM certificate scheme?
	3. Identify factors that **hinder** FM producers to participate in *FM certificate scheme* + weight	3.1 Do FM producers experience any difficulties in participating in the scheme? 3.2 What factors do you think have hindered FM producers from participating in FM certificate scheme?
	4. Examine their perception on *IFFO RS standard*	4.1 What do you think about IFFO RS standard? 4.2 What do you think are pros and cons of IFFO RS standard?
	5. Identify factors that **influence** FM producers to adopt *IFFO RS standard* + weight	5.1 What factors will influence you to adopt IFFO RS standard?
	6. Identify factors that **hinder** FM producers to adopt *IFFO RS standard* + weight	6.1 What factors do you think have hindered other FM producers from adopting IFFO RS standard?
Department of Fisheries (DoF)	**General questions**	
	A. Examine what current policies related to FM are and how they affect the adoption of IFFO RS and FM certificate scheme participation	A.a What is the current policy of DoF on sustainability issue in fishmeal industry? A.b Do you think the fact that FM producers buy trash fish actually causes a problem? If yes, how? A.c Does DoF have any plans or policies to cooperate with private sector to tackle the problem? A.d How do you think the fact that now the government strictly enforces the law affects the FM certificate scheme? Do FM producers participate more or less than before?
	B. Examine current status of FM certificate scheme	B.a How is it so far? How many FM producers have participated? B.b Do you or FM producers experience any difficulties in the process?

Stakeholders	Objectives	Questions
		B.c Do you think if it helps solve the problem? How? B.d Do you think if all FM producers participate in the scheme, will it solve bottom trawling problems?
	Specific questions	
	1. Identify factors that **influence** FM producers to participate in *FM certificate scheme* + weight	1.1 What factors do you think influence other FM producers to participate in FM certificate scheme?
	2. Identify factors that **hinder** FM producers to participate in *FM certificate scheme* + weight	2.1 What factors do you think have hindered FM producers from participating in FM certificate scheme?
	3. Examine their perception on *IFFO RS standard*	3.1 What do you think about IFFO RS standard? 3.2 What do you think about that currently CPF only buys IFFO RS certified FM? Would that affect FM producers' decision to participate in the scheme? 3.3 How can two systems integrate?
	4. Identify factors that **influence** FM producers to adopt *IFFO RS standard* + weight	4.1 What factors do you think will influence you to adopt IFFO RS standard?
	5. Identify factors that **hinder** FM producers to adopt *IFFO RS standard* + weight	5.1 What factors do you think have hindered other FM producers from adopting IFFO RS standard?
Animal feed mills	**General question**	
	A. Acquire the basic information	A.a How many tons of FM did you use fishmeal last year? A.b Which FM producers did you buy it from?
	B. Examine their sustainability policy	B.a What is your company's policy on sustainability issue regarding FM? B.b Do you participate in FM certificate scheme? If yes, why? If no, why not? B.c What was the percentage of FM with FM certificate from the total FM you bought?
	Specific questions	
	1. Examine their perception on *FM certificate scheme*	1.1 What do you think about FM certificate scheme? 1.2 If you participate, have you experienced any difficulties?

Stakeholders	Objectives	Questions
		1.3 Do you believe in the system of FM certificate scheme? 1.4 Do you think if it is necessary for FM producers to participate in the scheme? If yes, why? If no, skip the question 2.2 and 3.2. 1.5 What do you think are pros and cons of FM certificate scheme? 1.6 How do you think it can be improved?
	2. Identify factors that **influence** FM producers to participate in *FM certificate scheme* + weight	2.1 What factors do you think influence other FM producers to participate in FM certificate scheme? 2.2 As a buyer of FM, what do you think you can do to influence FM producers to participate in the scheme?
	3. Identify factors that **hinder** FM producers to participate in *FM certificate scheme* + weight	3.1 What factors do you think have hindered FM producers from participating in FM certificate scheme? 3.2 As a buyer of FM, what do you think you can do to support FM producers to participate in the scheme?
	4. Examine their perception on *IFFO RS standard*	4.1 Do you adopt IFFO RS standard? If yes, why? If no, why not? 4.2 What do you think about IFFO RS standard? 4.3 Since we already have the FM certificate scheme, do you think IFFO RS standard adoption is necessary or not?
	5. Identify factors that **influence** FM producers to adopt *IFFO RS standard* + weight	5.1 What factors do you think will influence you to adopt IFFO RS standard?
	6. Identify factors that **hinder** FM producers to adopt *IFFO RS standard* + weight	6.1 What factors do you think have hindered other FM producers from adopting IFFO RS standard?
NGOs	**General questions**	
	Understand their strategies in tackling with sustainability issue in FM industry	a. What do you think is the problem in FM supply chain? b. What is your strategy to tackle this problem? c. Do you think the fact that FM producers buy trash fish actually causes a problem? If yes, how? d. What do you think FM producers should do?
	Specific questions	

Stakeholders	Objectives	Questions
	1. Examine their perception on *FM certificate scheme*	1.1 What do you think about FM certificate scheme? 1.2 Do you think if it is effective? If no, skip next question. 1.3 Do you think if it is necessary for FM producers to participate in the scheme? 1.4 What do you think are pros and cons of the scheme? 1.5 How do you think it can be improved?
	2. Identify factors that **influence** FM producers to participate in *FM certificate scheme* + weight	2.1 What factors do you think influence other FM producers to participate in FM certificate scheme?
	3. Identify factors that **hinder** FM producers to participate in *FM certificate scheme* + weight	3.1 What factors do you think have hindered FM producers from participating in FM certificate scheme?
	4. Examine their perception on *IFFO RS standard*	4.1 What do you think about IFFO RS standard? 4.2 Since we already have the FM certificate scheme, do you think IFFO RS standard adoption is necessary or not?
	5. Identify factors that **influence** FM producers to adopt *IFFO RS standard* + weight	5.1 What factors do you think will influence you to adopt IFFO RS standard?
	6. Identify factors that **hinder** FM producers to adopt *IFFO RS standard* + weight	6.1 What factors do you think have hindered other FM producers from adopting IFFO RS standard?