

# Chapter 6

## Indonesian Seafood Supply Chain

*Suadi and Eiichi Kusano*

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# Chapter 6

## Indonesian Seafood Supply Chain

*Suadi\* and Eiichi Kusano*

### 1. Introduction

The total population of Indonesia in 2017 reached 263,991,379 people; it is still growing about 1.1% annually.<sup>1</sup> The growing population needs a measurable and good food supply system because, based on the consumption patterns of Indonesians, food expenditure is still very dominant, especially in the lower class of society. The World Bank indicated that Indonesian expenditure for food and beverages on average was about 49%.<sup>2</sup> Nevertheless, the expenditure of the lowest class for food reached 56%. The monthly per capita expenditure in 2013–2017 also showed no significant change of proportion of expenditure for food and non-food consumption. Both expenditures share half of household expenditures. Processed food and drinks share 32.7%, followed by cereals (11.6%) and fish (7.7%). In addition, food expenditure increased on average about 8.6% per year.

The Indonesian economy is still growing and has potential to grow faster. Indonesia's gross domestic product (GDP) at current US\$ reached \$1,015.54 billion with annual GDP growth about 5.1%. Its GDP per capita at current US\$ also increased from \$3,113.4 in 2010 to \$3,846.86 in 2017. The World Bank projected that Indonesia's GDP may grow to 5.3% in 2021.<sup>3</sup> Unfortunately, the role of agriculture, forestry, and fishing as the main food production sector tends to decline year to year, with contribution only at 13% of GDP (value added) in 2017, from 14% in 2010. On the other hand, importation of certain commodities has been increasing remarkably in order to fulfil the country's food needs Indonesia imported various food products such as salt for half of the total national need, 70% of soybean, 12% of corn, 15% of peanuts, 90% of garlic, 30% of beef, and 70% of milk (Husodo, 2014). FAOSTAT also depicted that based on data of net trade, the value of imported food, particularly for cereals and preparations, fruit and vegetables, meat and meat preparations, and dairy products (milk equivalent) is higher than export, except for fish and seafood that are mostly produced for export. The net trade of fish increased from US\$1,566 million in 1995 to US\$3,503 million in 2016.<sup>4</sup>

According to the International Trade Centre's top 20 export potential products of Indonesia to the world, seafood products, particularly frozen shrimp and prawn, placed tenth. The product performance shows the big potential to occupy the global market (unrealised

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\* Department of Fisheries, Gadjah Mada University, E-mail: [suadi@ugm.ac.id](mailto:suadi@ugm.ac.id)

<sup>1</sup> <https://data.worldbank.org/country/indonesia?view=chart>

<sup>2</sup> <http://datatopics.worldbank.org/consumption/country/Indonesia>

<sup>3</sup> Ibid no. 2.

<sup>4</sup> [http://faostat.fao.org/static/syb/syb\\_101.pdf](http://faostat.fao.org/static/syb/syb_101.pdf)

potential of 42%), if the technological level improved and the prices are better or stable.<sup>5</sup> As an archipelagic state, Indonesia has a great opportunity to develop its marine and fishery sector to produce food from the sea. For capture fishery development, the maximum sustainable yield is projected to reach 9.9 million tons/year, based on the recent stock assessment,<sup>6</sup> with total production of 6.4 million tons in 2017.<sup>7</sup> Meanwhile, the potential area for aquaculture, which includes mariculture, is about 12.1 million ha; brackish water culture, 3.0 million ha; and freshwater cultivation, 2.2 million ha – capable of producing 16.7 million tons. The potential of aquaculture is not only based on the two-dimensional aspect of the space, but three dimensions of the water area (including the depth of water). This fact shows the big potential of fish and seafood production in Indonesian fishery. However, there are several challenges in promoting good management of the fish business: some are caused by the country's archipelagic state with scattered islands and production centres, limited production infrastructure and supporting facilities, high logistic cost, low product quality, and lack of human power. As an example, the recent report of the EU-Indonesia Business Network (EIBN) showed the main production site in the eastern part of Indonesia (share 65% of national production) still lacks cold storage. The cold storage is available in the city around the provincial capital instead of fishing ports (EIBN, 2016). As result, cold storages are left empty most of the time because they are far from the fishing port or lading place.<sup>8</sup>

This chapter aims to describe the situation of the Indonesian seafood supply chain through literature and case studies on different industry and seafood commodities. This chapter covers the following issues: overview of roles and trend in food retailing, food consumption and regulation, case studies of seafood supply chain, and challenges and opportunities of Indonesian seafood development.

## **2. Retail Market and Food Retailing in Indonesia**

Modern retailers in Indonesia total about 30,000 units, with total company or owner of about 600. Only 25% of retailers transformed to digital; about 75% still rely on the conventional approach. Various modern retailers in Indonesia include modern stores, department stores, boutiques, factory outlets, specialty stores, trade Centres, and malls/supermarkets/plazas. However, the main market in Indonesia is the traditional market, numbering more than 4.5 million. USDA (U.S. Department of Agriculture) (2017) showed that the total number of outlets is also growing, such as convenient stores (15.6% per year) and supermarkets (11.3%). However, traditional grocery retailers are not growing; they even declined in 2011–2016. The modern food retailers are owned by both domestic and multinational companies. The growing interest of consumers in modern outlets because of their good performance, better nutritional information, safe-to-eat products, and convenience will soon result in the modern food retailers' capturing the traditional food retailers' market share (Toiba et al., 2013). As a

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<sup>5</sup> <http://www.intracen.org/country/Indonesia/General-Trade-Performance>

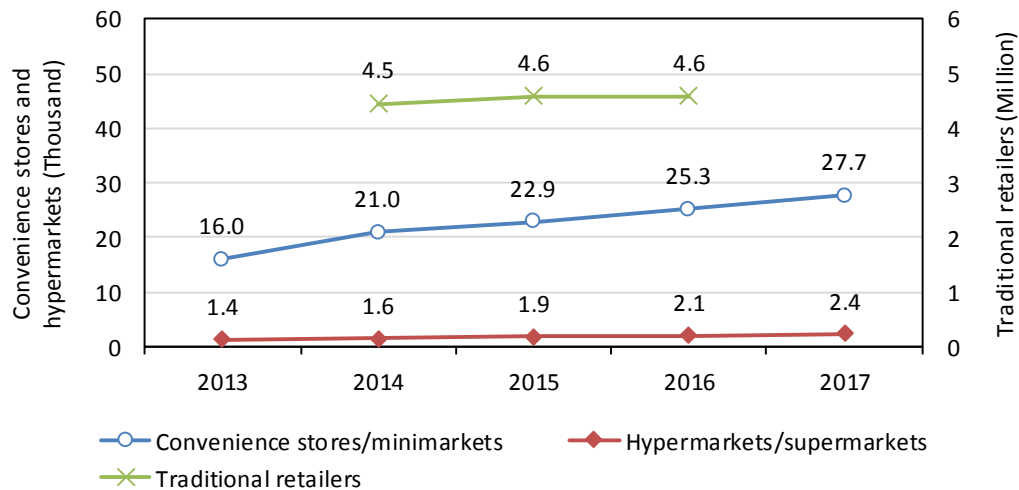
<sup>6</sup> Ministry of Marine Affairs and Fisheries Decree Number 47/2016

<sup>7</sup> <http://sidatik.kkp.go.id/publikasi/index/12>

<sup>8</sup> [https://indonesien.ahk.de//fileadmin/AHK\\_Indonesien/Publication/PDF\\_Publication/-EIBN/EIBNSe\\_cRep2016\\_ColdStorage\\_FULL-19984.pdf](https://indonesien.ahk.de//fileadmin/AHK_Indonesien/Publication/PDF_Publication/-EIBN/EIBNSe_cRep2016_ColdStorage_FULL-19984.pdf)

result, the rapid growth of the modern market has challenged the existence of the traditional market. Thus, the traditional market needs to adapt to the changing consumer choice while government support for innovative strategies is needed.

**Figure 6.1: Number of Retailers in Indonesia**



Source: USDA (2017).

Until 2017, almost 90% of the modern markets consisted of two groups, Alfamart (42.57%) and Indomaret (47.61%). These two convenience store groups increased in number, with Alfamart growing 2.04% and Indomaret, 1.97%.<sup>9</sup> However, other big stores like Ramayana, Giant, and Lottemart decreased.

The market value of supermarkets and hypermarkets was reported to be growing. In 2015–2018, supermarkets grew about 8.84% (compound annual growth rate [CAGR]), and hypermarkets at about 9.43% (CAGR). Unfortunately, the market value of department stores decreased by about 11.07% (CAGR), from Rp92.38 trillion in 2015 to Rp64.62 trillion in 2018. Some factors caused the decline, such as shift in buying behaviour to e-commerce, an increase in fixed costs which triggers a decline in competitiveness, and slowdown of the national economy. Some department stores started to close many of their outlets. However, the market value of the e-commerce industry grew 66.45% (CAGR) for 2015–2018, from Rp16.22 trillion in 2015 to Rp72.75 trillion in 2018 (USDA, 2017). This increase was also supported by the development of e-commerce in various types such as marketplace, customer-to-customer, and business-to-business e-commerce. The main advantages of e-commerce are cutting distribution and logistics lines, streamlining fix costs, and providing more product variations.

In general, the market value of the modern retail industry in Indonesia was estimated to grow 10.15% (CAGR) for the period 2015–2018, from Rp289.6 trillion in 2015 to Rp386.97 trillion in 2018. Food segment and fast-moving consumer goods or FMCG (for minimarkets,

<sup>9</sup> <http://duniaindustri.com>

supermarkets, and hypermarkets) were estimated to grow 12% (CAGR) in 2015–2018, from Rp181 trillion in 2015 to Rp249.6 trillion in 2018. This food segment and FMCG are classified as stable growth supported by the expansion of outlets. Table 6.1 shows the growth trend of modern retail market in Indonesia.

**Table 6.1: Growth Trend of Modern Retail Market in Indonesia**

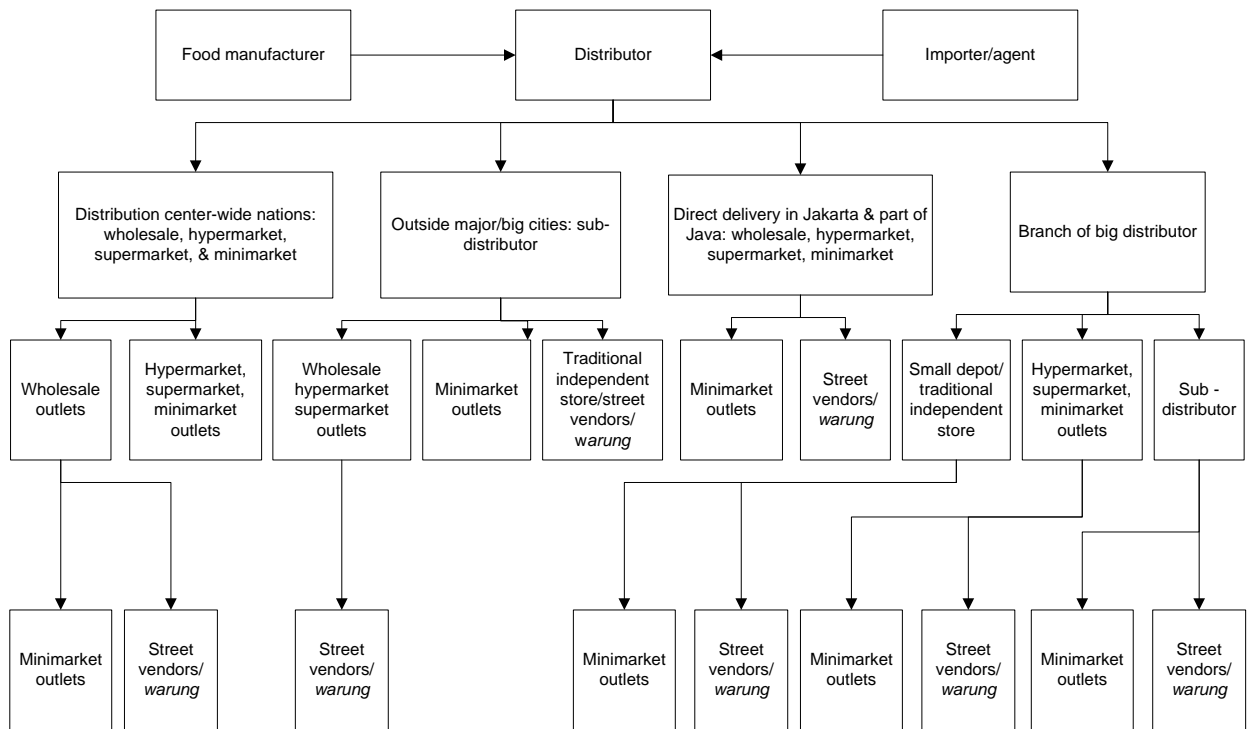
Items	2015	2016	2017	2018
Overall market value of retail modern industry (Rp trillion)	289.6	314.82	342.73	386.97
Growth (%)	-	8.7	8.86	12.9
Market value of food & FMCG retail (Rp trillion)	181	199.1	219	249.6
Growth (%)	-	10	12	14
Portion of food retail & FMCG to overall market (%)	62.5	63.24	63.9	64.5
Market value of department store to total retail industry (Rp trillion)	92.38	85.89	70.09	64.62
Market value of e-commerce (Rp trillion)	16.22	29.83	53.64	72.75
Growth (%)	-	83.91	79.81	35.63
Portion of e-commerce to the total food & FMCG retail (%)	5.6	9.48	15.65	18.8
Market value of minimarket (Rp trillion)	101.36	112.49	125.27	146.01
Growth (%)	-	10.98	11.36	16.55
Portion of minimarket to total food & FMCG retail (%)	56	56.5	57.2	58.5
Market value supermarket (Rp trillion)	36.2	38.82	42.05	46.67
Growth (%)	-	7.23	8.32	10.98
Portion of supermarket to total food & FMCG retail (%)	20	19.5	19.2	18.7
Market value hypermarket (Rp trillion)	43.44	47.79	51.68	56.92
Growth (%)	-	10.01	8.14	10.14
Portion of hypermarket to total food & FMCG retail (%)	24	24	23.6	22.8

FMCG = fast-moving consumer goods.

Source: <http://duniaindustri.com>

Related to the distribution channel of the food sector in the retail industry, the GAIN Report (USDA, 2017) showed that food supply may come from the local/domestic food suppliers and import. The food will then be placed and distributed by distributors to various channels. From the distributors, it will be channelled to the wholesalers, hypermarkets, supermarkets, and minimarkets.

**Figure 6.2: Typical Indonesian Retail Food Sector: Distribution Channels**



Source: USDA (2017).

### 3. Food Regulation

Food policy in Indonesia is basically regulated by Law No. 18/2012 on Food. According to this law, food supply must be sufficient; safe; of high quality; affordable; and in harmony with religion, beliefs, and culture. Domestic food production should be prioritised over imports (EIBN, 2017). There are also Government Regulation No. 69/1999 on Label and Food Advertising and Government Regulation No. 28/2004 on Food Safety, Quality and Nutrition. In addition are various related ministerial and other institutional decrees related to food issues.

The food regulations cover the issues on food safety, food quality and nutrition, food importation and exportation into and out of Indonesian territory, control and supervision, and community participation. Food regulations cover all aspects of the food/fish business process. In addition, new Law No. 33/2014 on the halal product assurance will also affect the food business process. Article 4 of Law No. 33 clearly states that products that enter, circulate, and trade in the territory of Indonesia must be halal certified. Therefore, halal certification is become an important instrument in the food business process in Indonesia.

**Figure 6.3: The Regulation Aspects of Food Policy in Indonesia**



Source: Author.

#### **4. Current State of Indonesia's Fish and Seafood Industry**

Fish does not only play an important role in income generation, employment, nutrition, and food security for many countries; it has also become a source of foreign currency earnings, particularly for many developing countries. By definition, fishery in Indonesia is defined as all activities relating to the cultivation and utilisation of fish resources and their environment, starting from pre-production, production, processing, up to marketing. Therefore, fishery is a business system that manages fish from the pre-production to the end market.

Exports of fish by developing countries, including Indonesia, rose from 37% of world trade in 1976 to 54% of total fishery export by 2014, valued at US\$80 billion. In 2014, fishery net export revenues in developing countries reached US\$42 billion, higher than other major agricultural commodities and even combined (FAO, 2016).<sup>10</sup>

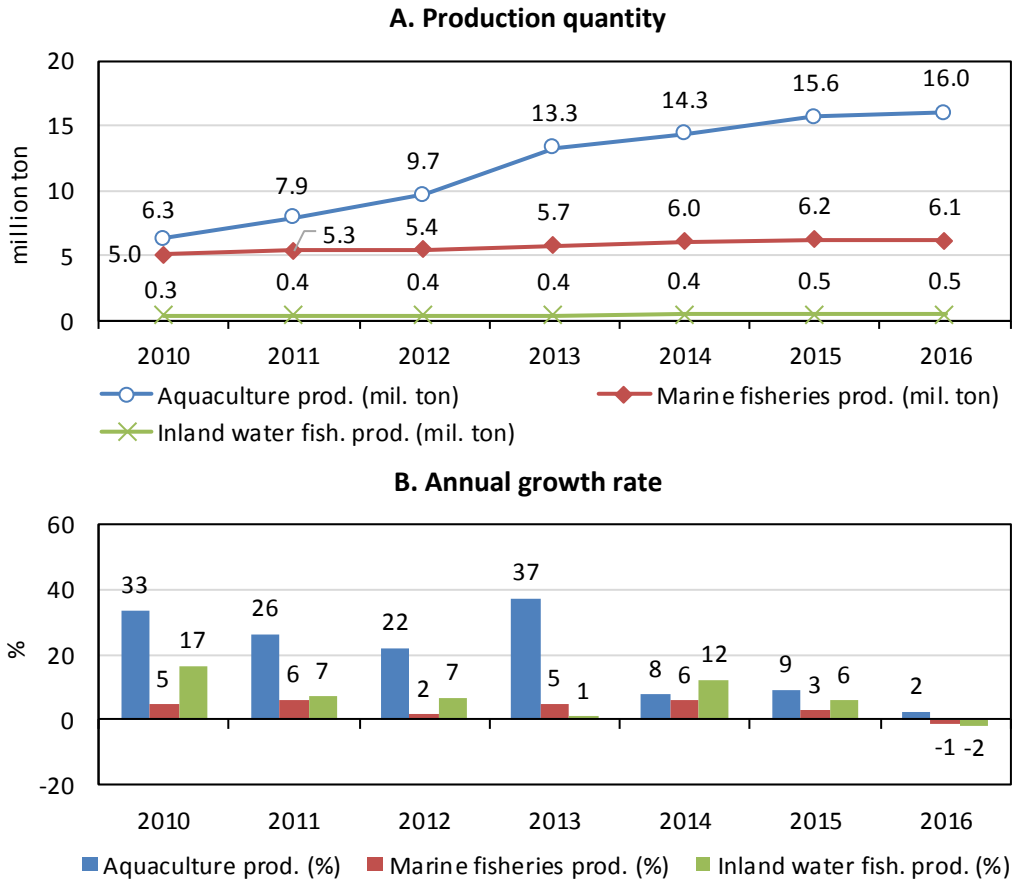
China is a main fish producer and the largest exporter country. Norway places second as it supplies diverse products to the global market. Viet Nam is the third major exporter, overtaking Thailand (FAO, 2016). As an exporter country, Indonesia is still less competitive than Viet Nam and Thailand even though it is the second-largest producer of marine fish in the globe after China.

Fish production in Indonesia basically comes from capture fishery and aquaculture. The share of production from aquaculture grew rapidly to more than 20% per year before 2014 while production from capture fishery slowed down. Both fish production sources might be expanded as the fishery resources become available to exploit and land and aquatic

<sup>10</sup> <http://www.fao.org/documents/card/en/c/2c8bcf47-2214-4aeb-95b0-62ddef8a982a> (accessed 24 October 2018).

resources to cultivate. A 2016 fish stock assessment reported about 9.9 million tons of fish stock, while fish production in 2017 was only about 6.4 million tons.<sup>11</sup> However, there are several challenges to developing the seafood industry, such as production infrastructure and supporting policy.

**Figure 6.4: Indonesian Fish Production Profile**



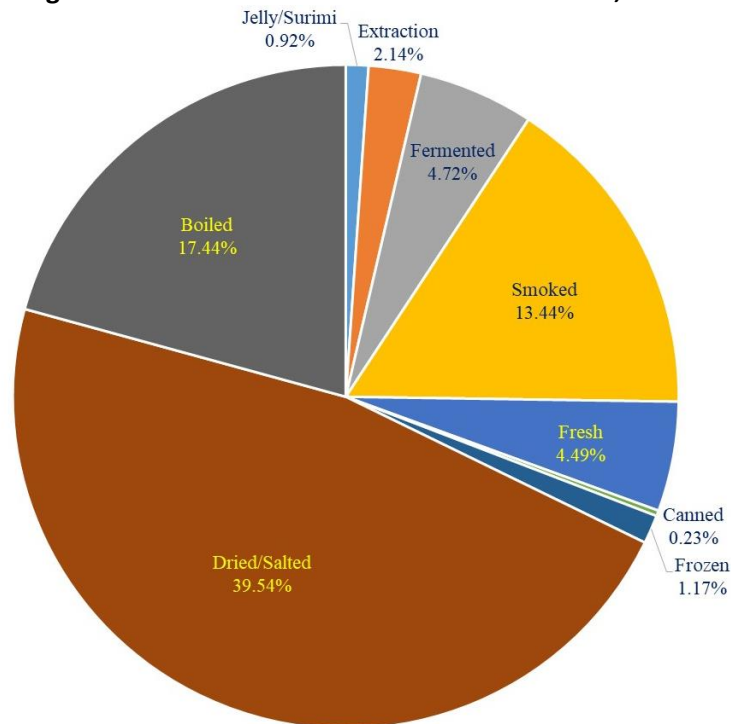
Source: BPS, <https://www.bps.go.id/statictable/2014/01/16/1711/produksi-perikanan-menurut-subsektor-ribu-ton-1999-2016.html> (accessed 22 February 2019).

The fish products are fresh (including frozen fish) and processed. Processed fish products, such as dried/salted and boiled, underwent traditional or simple processing. There are various types of processing, including surimi and canning.

<sup>11</sup> Ibid. Nos. 8 and 9.



**Figure 6.5: Variation of Indonesian Fish Products, 2014**



Source: Ministry of Industry (2017).

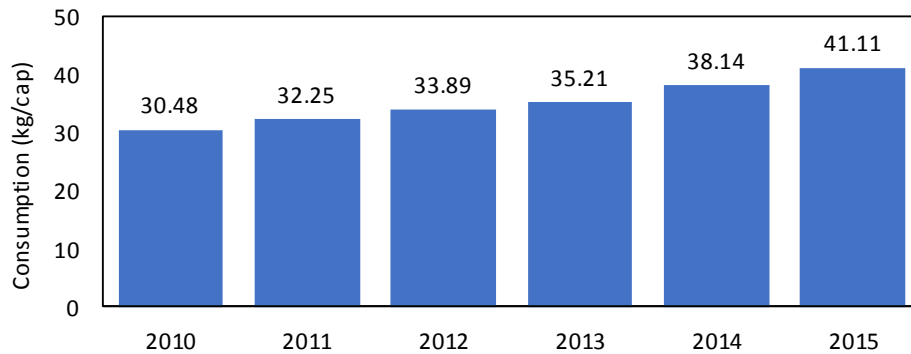
In 2010–2014, the production of processed fish products increased from 4,081,618 tons (2010) to 5,199,930 tons (2014). The average growth of the product was about 6.35% per year with the highest growth occurring in 2011 at 13.82%.

National fish consumption increases year by year and reached more than 40 kg/cap/year. The largest fish consumption in 2014 was found in Maluku Province (54.12 kg/cap/year), Southeast Sulawesi (50.77 kg/cap/year), Riau Islands (49.24 kg/cap/year), North Maluku Province (48.88 kg/cap/year), West Papua Province (48.16 kg/cap/year), and North Sulawesi Province (47.83 kg/cap/year). The provinces with the largest growth (above 10%) included the Special Region of Yogyakarta (DIY<sup>12</sup>) (22.28%), West Nusa Tenggara (14.78%), Central Java (12.31%), DKI<sup>13</sup> Jakarta (11.46%), and East Java (10.12%). In fact, DIY is one of the provinces with low fish consumption (21.74 kg/cap/year) but has potential to increase consumption of fish commodities.

<sup>12</sup> Special Region of Yogyakarta: Daerah Istimewa Yogyakarta (DIY).

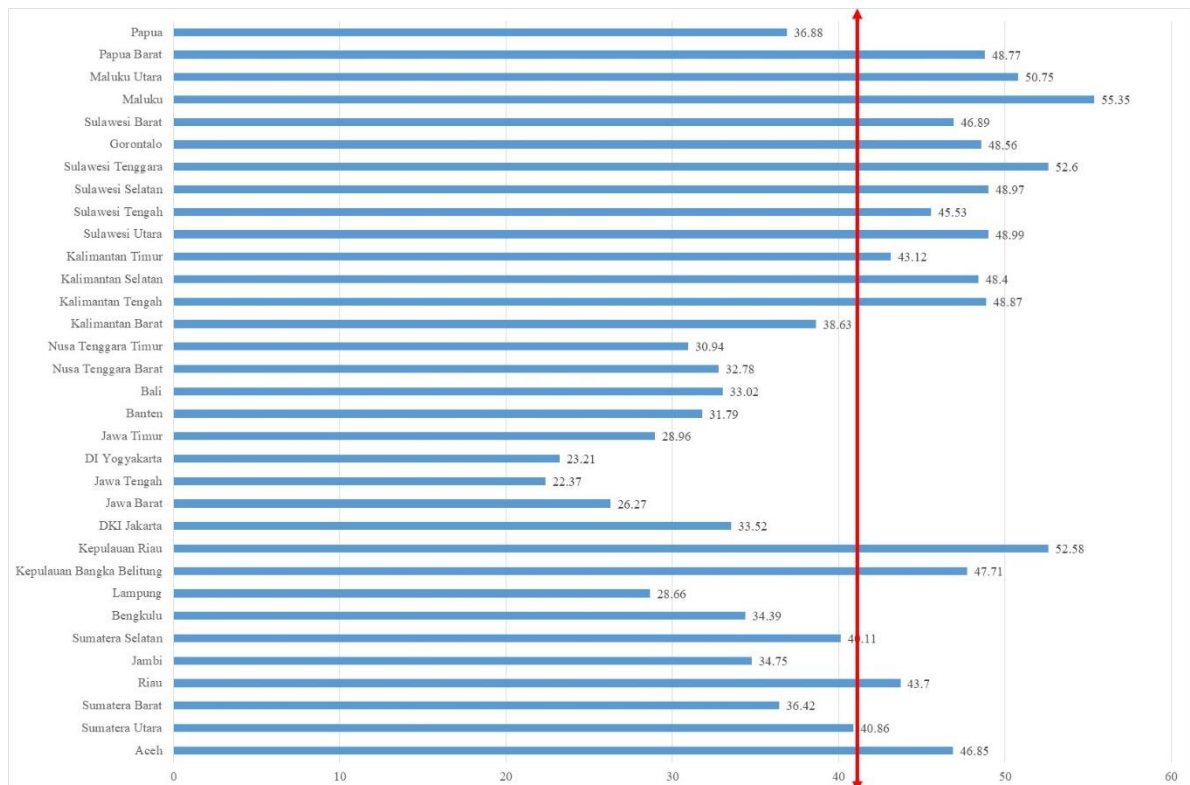
<sup>13</sup> Special Capital Region of Jakarta: Propinsi Daerah Khusus Ibukota (DKI) Jakarta.

**Figure 6.6: Indonesia Per Capita Fish Consumption**



Source: SIDATIK (Data Dissemination Information System and Marine and Fisheries Statistics), 2016. <http://statistik.kkp.go.id/sidatik-dev/Berita/Analisis%20Angka%20Konsumsi%20Ikan%202010-2015.pdf> (accessed 23 February 2019).

**Figure 6.7: Indonesia Per Capita Fish Consumption, 2015 (kg/cap)**

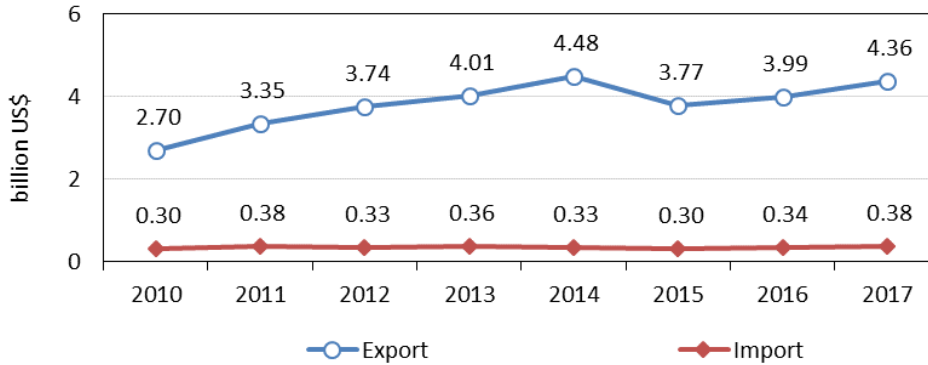


Source: Indonesia Ministry of Marine Affairs (KKP) <http://statistik.kkp.go.id/sidatik-dev/Berita/Analisis%20Angka%20Konsumsi%20Ikan%202010-2015.pdf> (accessed 23 February 2019).

Indonesia's main fishery export products are shrimp, tuna, cob, skipjack, seaweed, crabs, and pearls. On the other hand, Indonesia also import fish products such as fish flour and fresh/frozen fish. In 2010–2017, the export value increased but declined in volume. In 2010, the export value was US\$2.70 billion, and increased to US\$4.48 billion in 2014. In 2015, due to various policies issued by the Ministry of Marine Affairs and Fisheries (MAF), the export

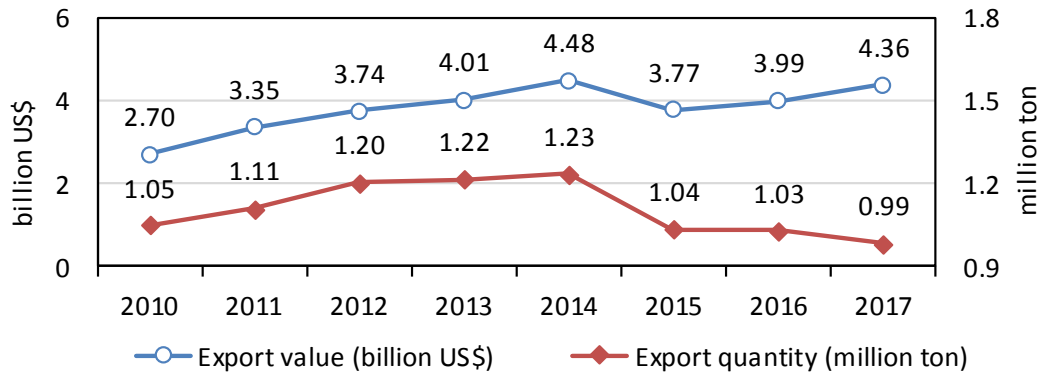
value decreased to US\$3.77 billion. The export value in 2017 was almost the same as 2014 (about US\$4.36 billion) but volume was still lower than in 2010–2014.

**Figure 6.8: Trends in Indonesia’s Fish Export and Import, 2010–2017**



Source: UN Comtrade.

**Figure 6.9: Value and Volume of Indonesia’s Fish Export, 2010–2017**



Source: UN Comtrade.

Asian countries are the main export market for Indonesia’s fish and seafood products, followed by America and Europe. The United States is the main market, followed by Japan and China. This data shows a major shift in the main market for fishery products for decades – from Japan (whose share during the 1980s was more than 80% and in the 1990s, more than 50%) to new markets in America and Europe.

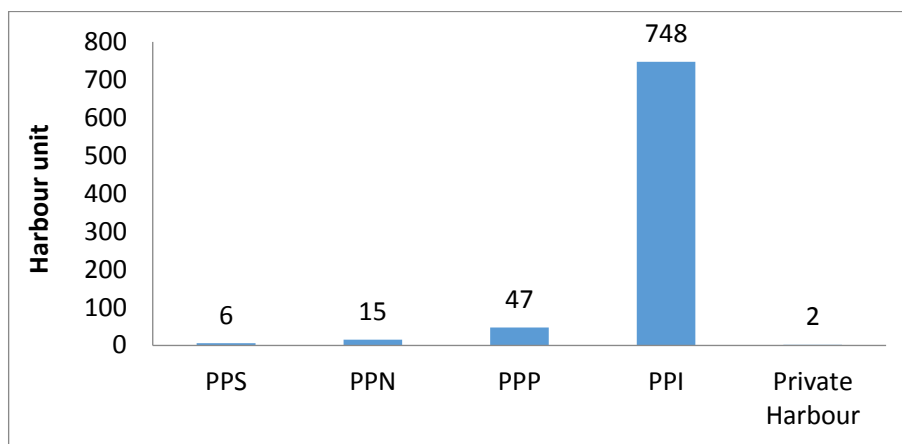
Several challenges in the fish and seafood industry development of Indonesia need appropriate strategies.

### **Lack of Feasible and Well-managed Fish Harbour**

The fishing ports in Indonesia are divided into four classes: ocean fishing port or PPS (class A), *nusantara* (archipelagic) fishing port or PPN (Class B), coastal fishing port or PPP (class C), and fish landing base or PPI (class D). The differences in the port class are based on the capacity and services that can be provided. Class A means the port is equipped with complete

facilities (primary, functional, and supporting facilities) for the largest scale fishery to operate. The total number of fishing ports is 818 units. There are 6 units of PPS, 15 units of PPN, 47 units of PPP, one of which is managed by the Ministry of MAF and the 46 are managed by the provincial government. Meanwhile, there are 748 units of PPI and two units of private fishing ports (Figure 6.10). This information shows that the majority of fishing ports only support traditional and small-scale fishery and modern fishing harbours are lacking to support large-scale fishery.

**Figure 6.10: Distribution of Fishing Ports in Indonesia Based on Class, 2015**

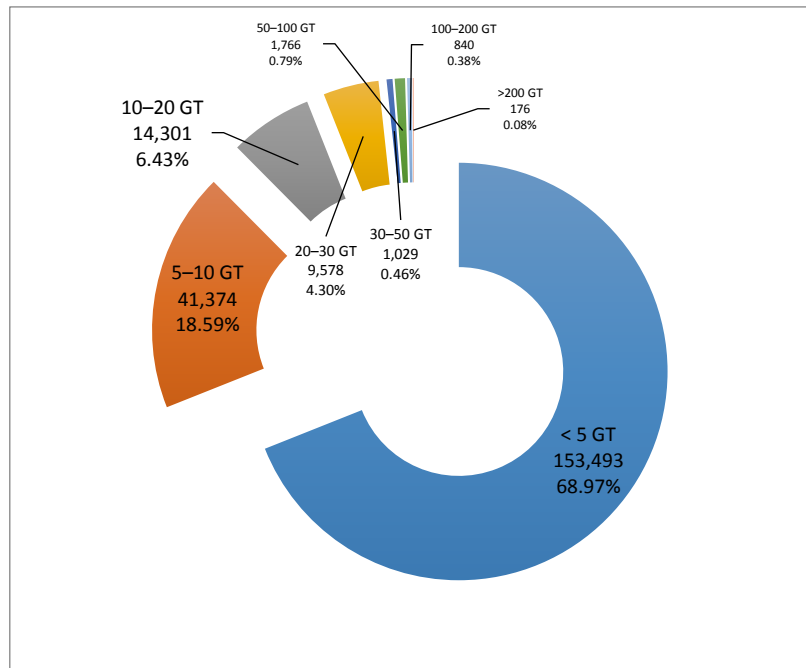


Source: SIDATIK (2015).

### **Weak Structure of the Capture Fishery Industry**

Indonesian fishing vessels are small-scale motorboats with less than 5 gross tonnage [GT]). They number 153,493 units or 68.97%, followed by 41,374 units (18.59%) of vessels of 5–10 GT, and 14,301 units (6.43%) of 10–20 GT. Overall, the total number of fishing vessels increased in 2009–2014. However, the increasing number was dominated by motorboats with less than 5 GT (from 105,121 units to 153,493 units), 5–10 GT motorboats (from 32,214 units to 41,374 units), and those with 10–20 GT (from 8,842 units to 14,301 units).

**Figure 6.11: Structure of Fishing Vessels in Indonesia's Capture Fishery Industry, 2014**



GT = gross tonnage.  
Source: SIDATIK (2015).

Figure 6.11 shows the lack of medium- to large-scale fishery. The current number of fishing vessels with more than 30 GT is only 1.71% of the total vessels; in many cases, they often face difficulties in anchoring because of the limited carrying capacity of fishing ports. Thus, it is necessary to support the large fishing vessels (with more than 30 GT). Improving the structure of fishing vessels to ensure the growing medium- to large-scale fishing industry is strongly related to the improvement of the state and function of fish harbours and human capital. In addition, to ensure the sustainability of the business and fishery resources, good fisheries governance particularly through a tight permission system is needed. Such governance could also be the way to fight illegal, unreported, and unregulated fishing.

#### **Lack of High Value-added Products**

As mentioned, most dried/salted, boiled, and paste fish products were processed in traditional ways. The value-added products need to be promoted to respond to the changes in the consumption and lifestyle of consumers.

#### **Fish and Seafood Quality and Safety Issues**

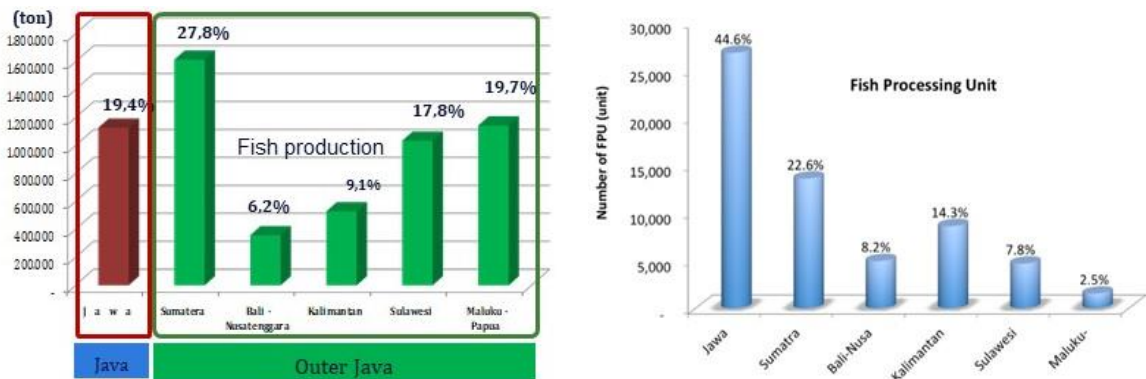
Many seafood products were rejected in the targeted market due to quality issues. It is important to secure and improve the quality and safety of seafood products. The improvement could be conducted along the supply chain of seafood products – from

handling in the fishing boats, landing places, to the processing units up to the consumers. The fish business may generate value-added products through improvement of handling and processing (to generate new products) and producing live fish product. The study of Hartana (2016) indicated that in 2005–2014, the US and Europe refused Indonesia’s fish products. In the same period, the US Food and Drug Administration reported as many as 699 cases and Europa-RASFF, 29 cases. The main causes of refusal by the US were filthy and salmonella-infested fish from Indonesia; the EU found issues of histamines and poor temperature control (*The Economist*, 2016). This information shows the need to pay attention to the quality and safety of fish products which are also clearly related to the lack of a cold chain system.

### High Disparity of Production and Processing Sites and Logistical Costs

The limitations of supporting infrastructure in fish production centres have led to a high cost economy in the fishing industry. The expensive logistics costs, low quality of seafood products, and high disparity of prices are the effects of these limitations. *The Economist* (2016) stated that underinvestment had sent Indonesia’s logistics costs soaring, averaging 27% of GDP in 2004–2011, compared with 25% in Viet Nam, 20% in Thailand, 13% in Malaysia, and 8% in Singapore).

**Figure 6.12: Main Locations of Fish Production (2012) and Fish Processing Unit (2014)**



Sources: Figure 6.10 and KKP (2014).

### Weak Cold Chain System

As previously explained, cold storage, as an important part of the cold chain system to ensure food safety and security, is not available in the production centres. In some cases, it is available in the provincial capital but it is not so close to the main fishing ports or landing places and are often left empty. Thus, improving the operation of national fish logistics will be needed soon.

### **Lack of Market Competitiveness**

As an exporter country, Indonesia is still behind other Southeast Asian countries, particularly Viet Nam and Thailand. Even though it is the second-largest fish producer in the world, there is still potential to expand production and market. *The Economist* (2016) stated that Indonesia exports only US\$4.2 billion-worth of fish annually, compared with US\$5.7 billion for Viet Nam and US\$7.2 billion for Thailand, both of which have smaller coastlines and lesser territorial water.

### **6.5. Seafood Supply Chain Model: A Case Study**

The case study of six seafood businesses aim to find opportunities and challenges in different types of seafood businesses in Indonesia as domestic and export market-oriented commodities and in the type of marketplace, particularly in the traditional market, as main transaction place for most Indonesians.

#### **Lobster Supply Chain Model at the Southern Coast of Java**

Lobster, a valuable marine resource in the southern coast of Java, particularly in Yogyakarta Special Province (DIY), triggered social change among farmers and fishers. The high economic value of lobster, as shown by its high price per kilogram ranging from Rp300,000 to Rp1,000,000 in DIY depending on species and size, increases the intensity of its exploitation. To conserve the lobster resources, government issued new policy on prohibition of lobster catch with certain conditions. This case study aims to describe the supply chain model of lobster and opportunities for better management at the southern coast of Java.

Lobster fishery at the south coast of Java can be categorised as small-scale fishery. The fishing fleet uses outboard motor boats with gill nets and *krendet* (trap net) as main fishing gears, and operates for 1 day. Five main species of lobsters are landed: *Panulirus penicillatus*, *P. homarus*, *P. ornatus*, *P. versicolor*, and *P. longipes*.

The catch is generally sold by fishermen through fish auction and directly to middlemen. Since not many landing sites conduct fish auctions, fishermen then directly sell their catch to middlemen. Prices are generally determined by buyers.

The total stock of lobster in the Indian Ocean at the southern coast of Java (Fishing Area No. 473) is about 844 tons per year, with exploitation level (E) at 0.54. According to Ministry of MAF Decree No. 47/2016, it is categorised as fully exploited, meaning that the fishing effort needs to be secure at that level with tight monitoring. Compared to other fishing areas in Indonesia, the state of lobster exploitation at the southern coast of Java is the lowest. Therefore, there is still opportunity to promote lobster fishery with better management even though the central government through the Ministry of MAF released a new policy (Decree No 1/2015 revised to No 56/2016) to control the allowable size.

After the new lobster regulation issued in 2015, only lobster of standard size could be auctioned and sold to exporters. The standard size allowed is a minimum carapace length of

8 cm and/or a minimum weight of 200 grams. Collector/middlemen sell the lobster from auction to local companies (at the south coast of Java) and these companies sell the product to other companies outside the area. The two main markets are Bali and Jakarta and lobster is usually exported. In addition, these two regions are also the main domestic market for lobster.

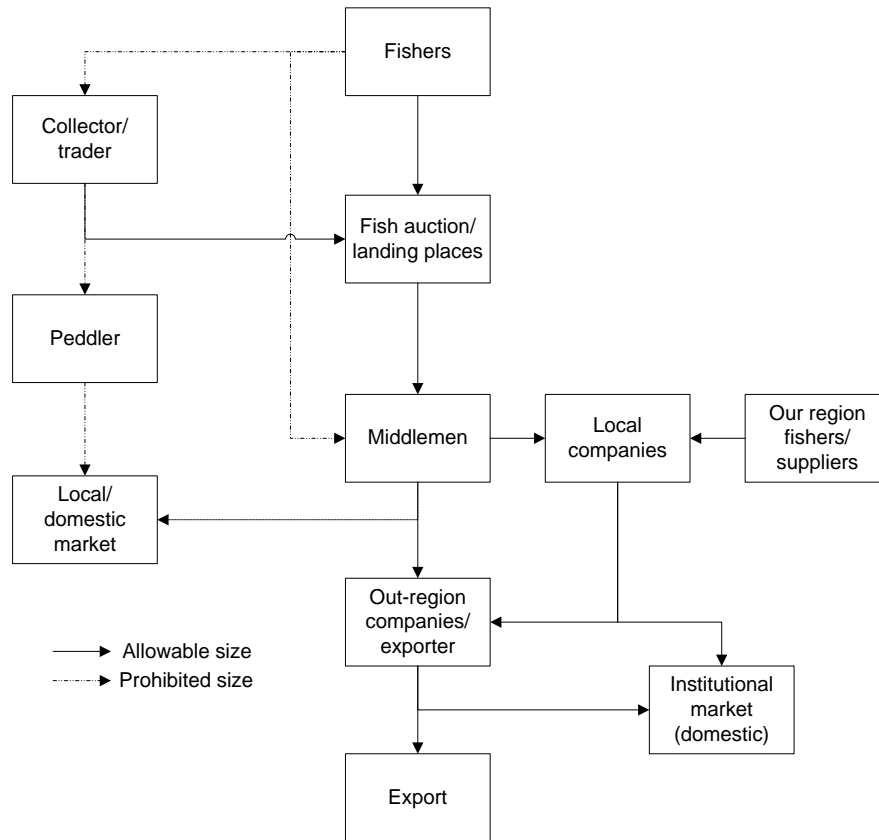
The study also found that undersized lobsters are also traded, especially in the areas around fish landing places, which are also regional tourism centres. Until now, there are still debates related to the academic foundation on the regulation of lobster size allowed be sold. However, the uncertainty and weak law enforcement, on one hand, and availability of lobster markets for all sizes (including prohibited size) on the other hand, threaten the sustainability of lobster resources on the south coast of Java and of the lobster supply chain.

Figure 6.13 shows two main characteristics of the lobster supply chain in the southern coast of Java: (i) regulated or allowable size model and (ii) prohibited size model. The first model has many players, involving the fishers, auctioneers, traders, companies as exporter, and various logistic services. Most of the lobster from fishers is sent to the domestic and/or export markets. In the second model, lobster is provided only to local consumers through peddlers or small-scale traders directly selling the product to consumers, particularly tourists.

Lobster from fishermen is sent by suppliers (mainly middlemen) to several large companies or collectors in Yogyakarta, Cilacap, and Pangandaran (southern coast of Java), and Semarang and Jakarta (northern coast of Java). Collectors also send lobsters to Bali, an outer island of Java. Exports are generally carried out by companies based in Jakarta. Based on discussions with the office of Fish Quarantine Agency of Yogyakarta, lobster shipping traffic through Yogyakarta's Adisucipto International Airport showed there were 123–278 certificates, with live lobsters numbering 35,675–93,629 in 2016–2018, in addition to non-living lobsters.



**Figure 6.13: Lobster Supply Chain Model at the Southern Coast of Java**



Source: Author.

As lobster must be kept alive to keep its high value, the capture techniques, handling, and transporting are still a challenge. Therefore, better technology is needed to ensure a high survival rate in lobster fishery. The lobster market is still expanding, targeting export markets and high-class consumers, particularly in main cities and/or tourism sites such as Bali and Jakarta. Nevertheless, the local market for undersized lobster must be controlled to avoid the catch that may trigger the rapid decline of lobster stock. Therefore, lobster management must be enforced and the solution to the current situation must be discussed with all actors in the lobster industry. The awareness of fishers, traders, and consumers related to lobster regulation must be raised through various government programmes, such as extension and education programmes and alternative livelihood promotions. Such effort is needed because the bigger the lobster size, the higher the price. For example, a 200–300 gram *P. ornatus* costs only Rp400,000 per kilo, but as the weight increases to more than 1 kilo, the price goes up to more than Rp1,000,000 per kilo. Similarly, the price of *P. longipes* is only Rp310,000 per kilo for 200–300 grams, but increases to Rp720,000 per kilo if it weighs more than 300 grams.

The continuity of supply from capture fishery is still emerging, but lobster culture still lags. The promotion of aquaculture is needed, starting from research and development of lobster hatchery. This effort will impact the growing of a new industry, lobster culture, and the rebuilding of lobster stock through a restocking programme.

### **Anchovy Supply Chain Model in Medan City, North Sumatra**

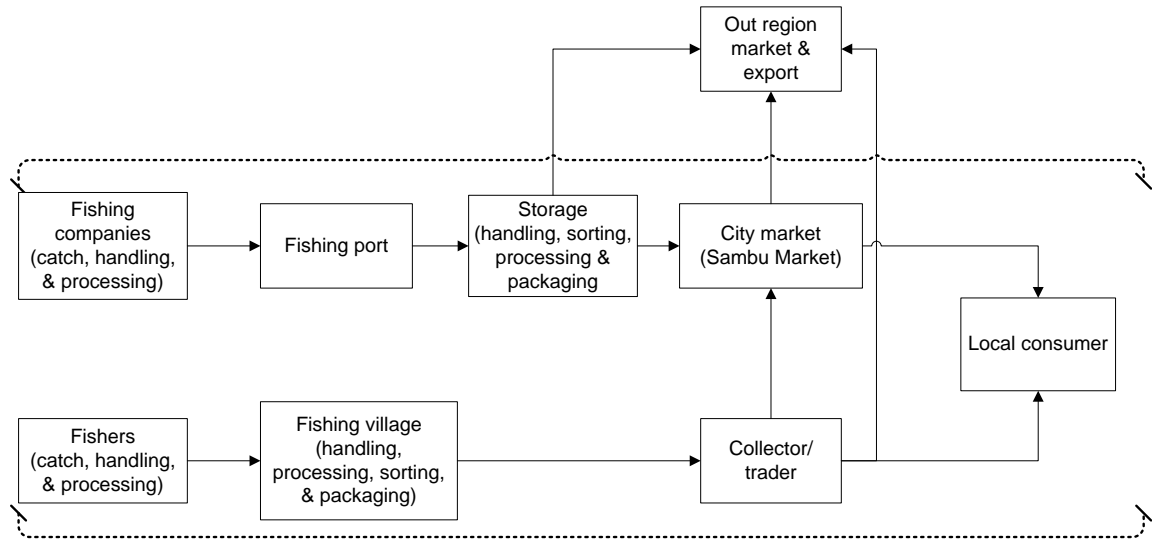
This study was conducted in two close research sites with different characteristics: (i) Belawan Bahari Village (fishing village) and (ii) Belawan Ocean Fishing Port (PPS) Medan City, North Sumatra. Belawan Bahari fishermen carry out anchovy fishing operations for 1 day and land the catch directly around the fishermen's settlement. For the PPS, fishers generally serve fishing companies. Thus, the respondents of this study are fishermen who captured/landed their catch, particularly anchovies in Belawan Bahari village and related buyers, and respondents in fishing ports (anchovy fishing and processing companies and their buyers).

The landing in the fishing village was recorded by the local government and that for the fishing port was conducted by the port authority. Based on data from the fishing port, total landed in 2017 was 28,709 tons (valued at Rp826,172,604,000), a significant decline from 2012 (63,305 tons valued at Rp1,532,813,242,000). Ten dominant catch landed in PPS Belawan: (i) mackerel scads – 7,371 tons (25.7%); (ii) common squid – 4,909 tons (17.1%); (iii) Indian mackerel – 2,215 tons (7.7%); (iv) lizardfish – 2,118 tons (7.48%); (v) mollusc goatfish – 2,002 tons (7%); (vi) croaker – 1,472 tons (5.1%); (vii) anchovy – 1,384 tons (4.8%); (viii) yellow stripe scads – 1,159 tons (4%); (ix) Japanese threadfin bream – 1,092 tons (3.8%); and (x) cuttlefish – 836 tons (2.9%). Most of the catch was sold as fresh fish product (74% of total production) (KKP, 2017) while anchovies were mostly sold as processed product.

Anchovy (*Stolephorus* sp.), locally well known as *teri medan*, is a high-value commodity. The average price is recorded at Rp80,000 to Rp100,000 per kilogram.

Figure 6.14 shows two main supply chain models of anchovies: (i) fishing village–based production (community based) and (ii) fishing port–based production (enterprise based). The main difference between the two models is the role of the trader, which is obvious for the community-based model. However, the city market is the central market for anchovies before these are distributed to the local markets, out regions, and the export market. This figure shows the important role of the traditional city market in the supply chain model. As discussed, the city market still plays a central role in the economic activities of many cities in Indonesia.

**Figure 6.14: Anchovy Supply Chain Model in Medan City, North Sumatra**



Source: Author.

Anchovy is captured by trawler, set lift nets, and *bagan* (lift net). The catch is sorted to separate anchovies from other fishes, and then cooked in a drum with a capacity of about 50 kilograms. Boiling and slicing are conducted on the fishing boat, and the drying process on the ground in the port area or fishing village, and then packaged for the market. The total volume of about 1,384 tons of anchovies was processed in port, though this number declined compared to a few years back. Rahayu et al. (2017) recorded that, in 2015, 23 companies in the fishing port produced 2,319.2 ton of anchovies. The prohibition of trawling in 2015 decreased anchovy production.

The main market of the production-based supply chain model is the city's central market. Almost half of production is distributed to the main market and other markets around the city. Nevertheless, the anchovy is also distributed to other main cities, such as Pekanbaru, Palembang, Padang (Sumatra islands), and Jakarta (Java island). For the export market, the product is mainly exported to Southeast Asian countries and Japan.

Anchovy fishery still faces some challenges. The release of the trawling prohibition policy in 2015<sup>14</sup> significantly impacted anchovy fishery as shown by the declining fish production. Although the policy has been 'loosened' due to demonstrations by various groups of activists and fishermen, the impact was not fully restored. The trawling policy is still not cancelled; therefore, more environment-friendly fishing technology is needed in anchovy's fishery. In addition, most anchovy products are handled on board (sea) and the drying process on land; most dried products are sold directly to the local and domestic market and a few for export. Value-added products other than dried are limited and need to be promoted through new product innovation and packaging. In the meantime, the industry still faces low product quality and safety issues.

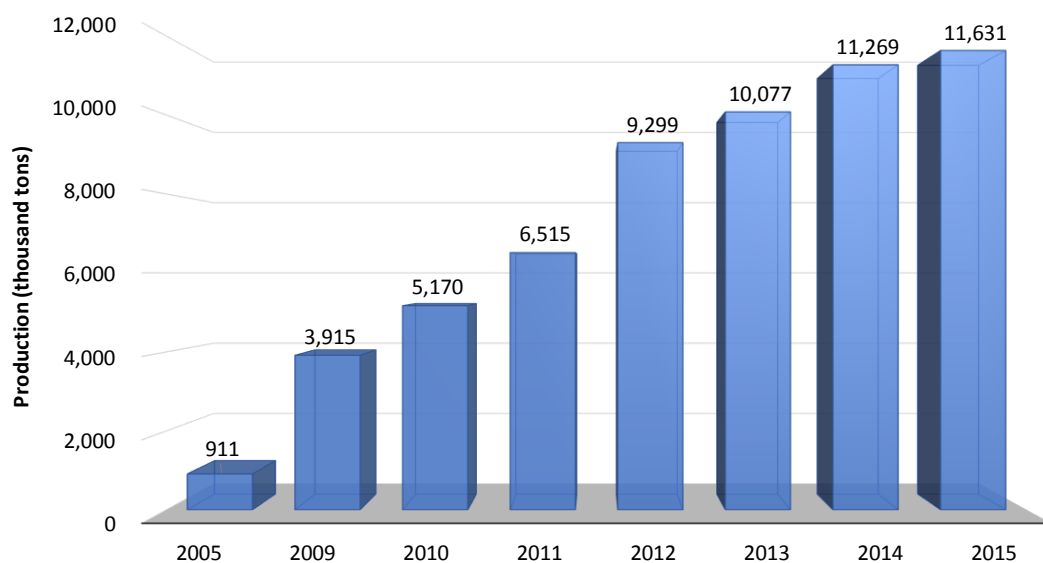
<sup>14</sup> Ministry of MFA Decree No. 1/2015 revised to 56/2016.

The anchovy industry still relies on small-scale individual business and lack of collective-based business such as fishery cooperative and/or other business entities. Fish products are, therefore, scattered in terms of location of production, price, and quality. The market of anchovies as other fish products is still open for the domestic and export markets. There are also various opportunities to prepare anchovy products to be easy to cook, ready to eat, and with longer shelf life.

### Seaweed Supply Chain Model in Makassar, South Sulawesi (Processing Unit)

China and Indonesia are the main producers of world seaweed, each with a share of 47% and 38.7%, respectively, of the total production of about 30.05 million tons (FAO, 2018). Indonesian seaweed production increased almost three times between 2010 and 2015. The rapid growth of seaweed culture is due to the development of cultivation of *Kappaphycus alvarezii* and *Eucheuma* spp., which are the main raw materials for carrageenan extraction.

Figure 6.15: Indonesia's Seaweed Production



Source: FAO (2018).

Seaweed has potential for development for several reasons, mainly:

- Various species are feasible to develop in wide development areas.
- Business capital is relatively small, the technology level is simple, and the harvest age is relatively short (1.5–2 months).
- Revenue is high, so there is potential to increase the income of the community and the region.
- Product can be diversified up to more than 500 end products.

- Provide high employment opportunities,
- It has domestic and foreign market opportunities.
- It can empower coastal communities.

In addition to the development of the food industry, the development of the health industry, cosmetics, fertilisers, and seaweed-based renewable energy requires large seaweed supply. Potential areas for the development of seaweed production centres are actually in disadvantaged areas, especially in eastern Indonesia (KTI). At present, from 183 districts in disadvantaged regions in Indonesia, 70% are estimated to be in KTI, an area dominated by many islands. Some potential areas and which have been designated as centres for seaweed development are Gorontalo Province, Southeast Sulawesi, Central Sulawesi, South Sulawesi, Maluku, North Maluku, West Nusa Tenggara, and East Nusa Tenggara.

Not only upstream development but downstream development is also a strategy in increasing commodity value added. Therefore, the downstream improvement is expected to have an impact on strengthening the industrial structure, increasing added value, and fulfilling the domestic market and increasing exports of processed seaweed. Because of increasing market demand, the price of seaweed in the international market has reached US\$2 per kilogram (Tempo, 2013). Unfortunately, until now most Indonesian seaweed is generally exported in the form of raw materials, particularly dried seaweed. On the other hand, processed seaweed products such as agar, carrageenan, and alginate are still imported in large quantities at high prices.

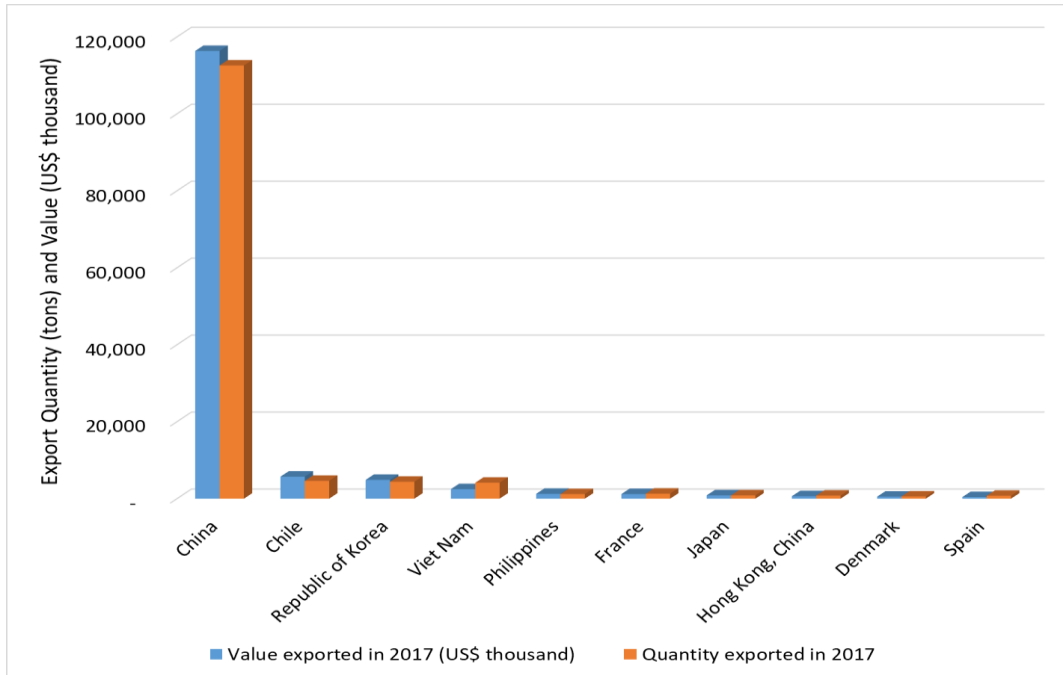
This case study was conducted at a seaweed processing company, so-called RAPUD, that exports dried seaweed to an industrial estate in Makassar City, South Sulawesi. The business started by educating seaweed farmers on how to cultivate seaweed, then buying their product. The company even provides capital for production equipment. The company, categorised as the early players in the seaweed business, was founded in 2002. The warehouse/processing capacity of the company is around 1,000 tons per month but currently only about 400 tons per month are processed. Companies buy dry seaweed from local suppliers or assisted farmers (around Sulawesi) and outside the island, especially Kalimantan and Tual, Maluku. Shipments from Sulawesi island use trucks; those from outside the island use marine transport. Purchases are made with two systems, namely, the contract system and fee system. The main buyer of dried seaweed for the company in this case is the Philippines, but now other markets such as Europe also buy dried seaweed. However, recently the main market of Indonesian seaweed is China (Figure 6.16). The export trend of Indonesian seaweed was also dynamic, which grew faster in 2013–2015 and declined in 2016 (Figure 6.17). One reason for this, particularly the decline in 2016, was the prohibition policies to export dried seaweed.<sup>15</sup> In addition, the seaweed business still has many challenges, such

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<sup>15</sup> <https://ekonomi.bisnis.com/read/20151102/99/488214/arli-larangan-ekspor-rumput-laut-mentah-2020-perlu-kajian-mendalam>.

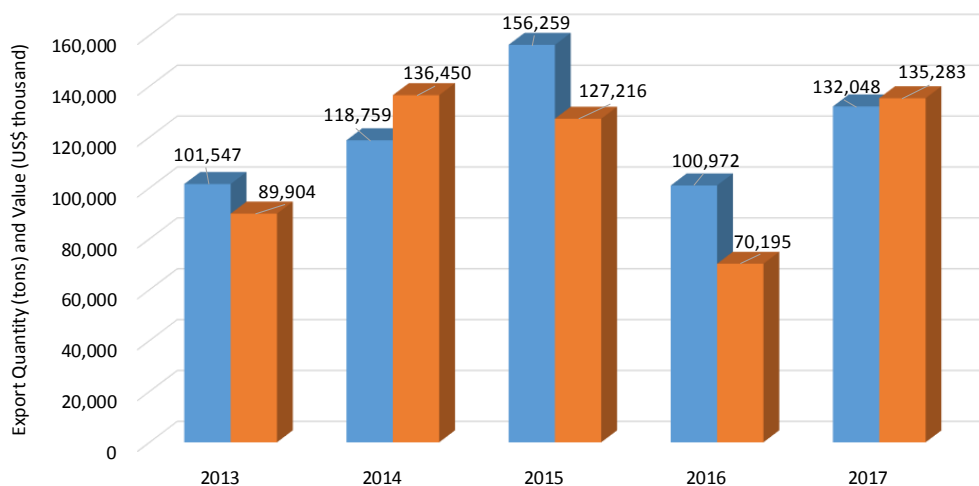
as mix cropping pattern in which different species are cultivated in the same or nearby area, competition among buyers for seaweed, seaweed diseases, and the quality of seaweed.

**Figure 6.16: List of Main Importing Markets for Seaweed Product (HS Code 121221) Exported by Indonesia in 2017**



Source: International Trade Centre database, <http://www.intracen.org>.

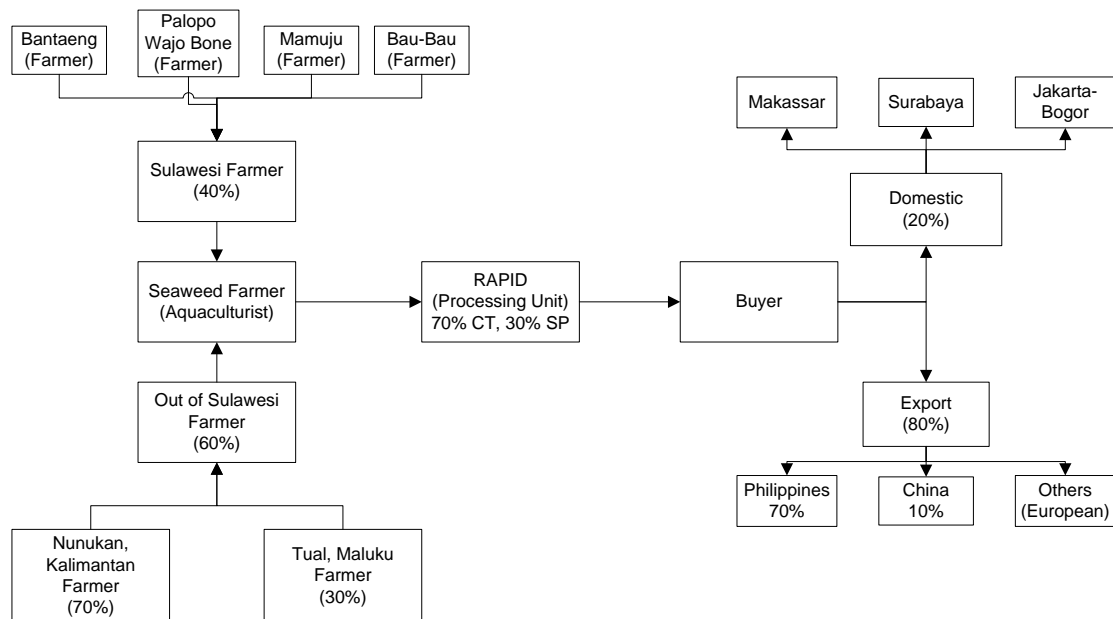
**Figure 6.17: Export Trend of Seaweed Selected Product (HS Code 121221) from Indonesia, 2013–2017**



Source: International Trade Centre database, <http://www.intracen.org>.

Figure 6.18 shows the typical supply chain model of the seaweed industry in the study site. The main players in the business are farmers, collectors, processors (companies), and buyers. The industry in the case study relies on dried seaweed from around Sulawesi and other islands in the eastern part of Indonesia. Nevertheless, more than half of raw materials are supplied by farmers from other islands. The distant source of raw materials has created logistic problems due to the high cost of transporting raw materials from producers to processors. The high competition over the local seaweed caused the company to find other suppliers from outside the province (islands). To ensure the sustainability of dried seaweed supply, the processors collaborated with producers (seaweed farmers) on technical assistance, seaweed farmers' training, and financial capital support. However, the seaweed farmers are not well organised; therefore, it is important to strengthen collective-based seaweed production to fulfil the need for standardised seaweed products from farmers and to facilitate empowerment and cooperation.

**Figure 6.18: Seaweed Supply Chain Model in Makassar, South Sulawesi**



Source: Author.

Indonesia, particularly South Sulawesi, is the major and rapidly growing producer of seaweed, particularly for raw materials of carrageenan extraction. Seaweed culture can potentially optimise marine space and solve many coastal community problems, such as poverty, as it can be a new source of income. Nevertheless, seaweed production still faces the problem of good seed quality and occurrence of diseases, locally called *ici-ici*, that may cause total loss of seaweeds.

The current seaweed industry mainly focuses on the upstream side of the business, particularly on producing wet and dried seaweed (farmer to processor), or lack of value-added product (advanced processing industry). Most seaweed products, particularly dried

seaweed, are exported as raw materials. Therefore, the downstream step is expected to impact on strengthening the industrial structure, increasing added value, fulfilling the domestic market, and increasing exports of processed seaweed.

In particular, the export market for seaweeds, whether as raw material or end product, is still expanding. The domestic market, particularly for food and health, is also growing. However, the processing industry is still lacking in number and many in the industry rely only on dried seaweed products.

### **Fish Supply Chain Model at Traditional Markets in Yogyakarta City**

The number of traditional markets in Indonesia is very large, more than 13,450 markets, with total traders reaching 12.63 million people. The market is not only a place of economic transactions but also a public space where social interaction takes place. However, the traditional market mostly has a negative image of being chaotic, uncomfortable, and a place with minimal facilities. Revitalisation of the traditional market is needed and is a long-term investment as part of the city's development. In many cities in Indonesia, the traditional market symbolises the face of the city – a well-organised traditional market means the city is also well managed. The traditional market has also become a national indicator of domestic inflation.<sup>16</sup>

This case study has been conducted in one of the central markets in Yogyakarta city, the so-called Beringharjo Market. It is the largest traditional market in Yogyakarta owned and managed by the city of Yogyakarta. This market is located in the Malioboro area, which is an area at the centre of DIY. The strategic location and proximity to tourist centres makes Beringharjo Market the main destination of raw materials of any product, including fish. In terms of fish consumption, this province is one of the lowest fish consumers compared to the other provinces of Indonesia. But the growth in consumption recently became the highest in the country. It was projected that, until 2014, the province needed about 89,614.30 tons but the fish products were mainly imported from other regions around the province.

The study showed that fish commodity in Beringharjo Market consists of marine, freshwater, and processed fish, such as salted fish and *bandeng* (milkfish) *presto* (softened bone) product. About 86% of fresh fish in the market comes from outside DIY and only about 14% are local fish. Ninety percent of freshwater fish is from outside DIY and ten percent is from a local area in DIY. Salted fish and milkfish as raw material are both 100% from outside DIY.

Analysis of the supply chain pattern of fish processing units (UPI) in DIY shows a distinctive pattern in supply chain management, especially in the supply of raw materials to UPI. There are two general trends from the case study in DIY related to the management of raw materials from marine products: (i) UPI generally manages raw materials that are not from

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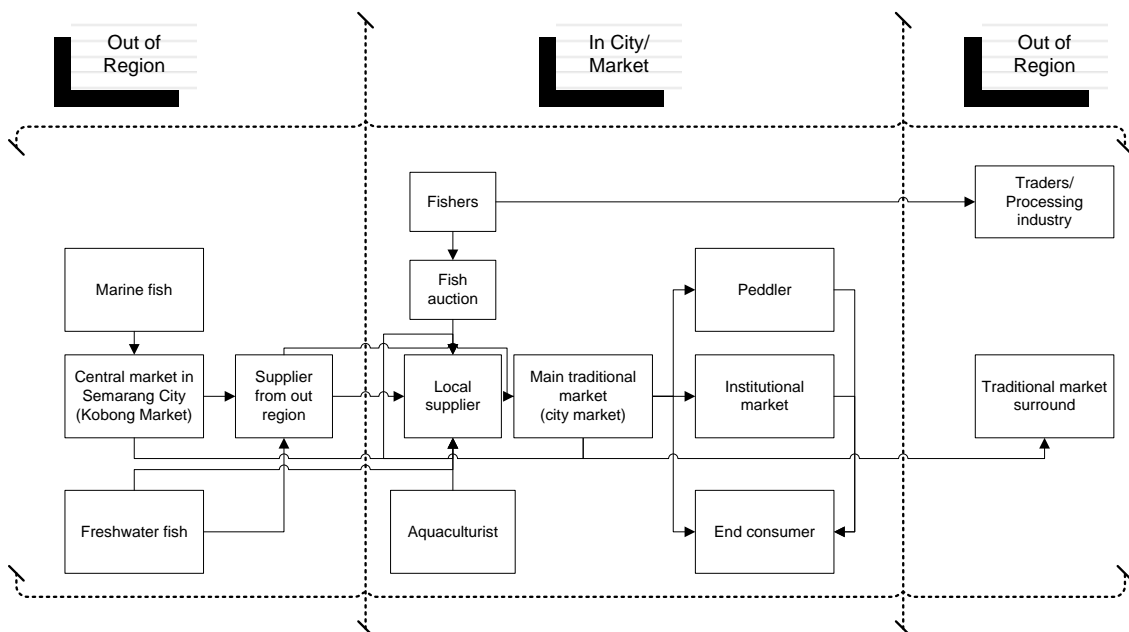
<sup>16</sup> Traditional markets provide the majority of people's basic needs and are central to regional economic activities, so the dynamics of prices of basic necessities in the traditional markets might become an indicator of regional economic conditions.



DIY but imported from outside DIY, and (ii) DIY fishery products as a source of raw materials are generally brought outside DIY. These findings illustrate the characteristics of UPI that have little connection with DIY production or local DIY suppliers for the supply of raw materials. This is caused by several factors, including processed fish whose species are scarce or are not produced in DIY such as milkfish, limitations and uncertainties of local fish as raw materials, and local fish that tend to have good distribution channels outside the region.

Figure 6.19 shows a supply chain model for fresh fish involving three parties: the suppliers, the sellers, and the ultimate customers. The supply chain model for processed fish involves four parties: the suppliers, the wholesalers, the retailers, and the ultimate consumers. Finally, the supply chain model for milkfish comprises the suppliers, the UPI, the wholesalers, and the ultimate consumers.

**Figure 6.19: Fish Supply Chain Model at Traditional Market in Yogyakarta City**



Source: Author.

The traditional market, as found in this case study, has become a place for nurturing entrepreneurs and prospective entrepreneurs with their own capital. Nevertheless, most such entrepreneurs lack an understanding of consumer behaviour, including in seafood products. Therefore, apprenticeship, training, and education are needed. In addition, the traditional market as, in this case, also provides various fish products – marine fish, freshwater fish, and processed fish – that are originally from various regions. Being a perishable good, fish gets easily spoiled without a cold chain system. Therefore, it is important to improve the distribution and cold chain management systems in the traditional market. Provision of support for traders, such as for insurance and financial capital, is still needed.

## **Tuna and Tuna-like Supply Chain Model at Fish Processing Unit in Bitung City, North Sulawesi**

The city of Bitung is located on the edge of the Pacific Ocean. The city is the main producer of fish, particularly tuna and tuna-like, in North Sulawesi Province and Indonesia. The city's fishing industry is centred at the Bitung Ocean Fisheries Port (PPS). Based on the 2016 PPS Bitung Annual Report (PPS, 2016, 12,973 fishing fleets visited the port, including 1,592 outboard motor boats (12%), most of which were motorised boats under 30 GT (76%), and the remaining motorboats were over 30 GT.

Fish production is mainly through purse seine fishing gear (77%), followed by pole and line (10.9%), and handline (9.8%); total fish produced was 46,522 tons. Fish production grew from 30,018 tons in 2012 to 111,315 tons in 2014. However, in 2015, it declined significantly and had not returned to a convincing growth in 2016, reaching only 46,552 tons. This decrease was mainly due to new regulations relating to capture fishery to reduce the problems of illegal, unreported, and unregulated fishing.<sup>17</sup>

Skipjack tuna and tuna are the main fish products landed in Bitung PPS. In 2012–2016, the average production of skipjack tuna reached 34,001 tons/year, while that of tuna was 11,826 tons/year. In addition to skipjack and tuna, cob is also an important commodity in the Bitung PPS. The average production of cob reaches 7,166 tons/year.

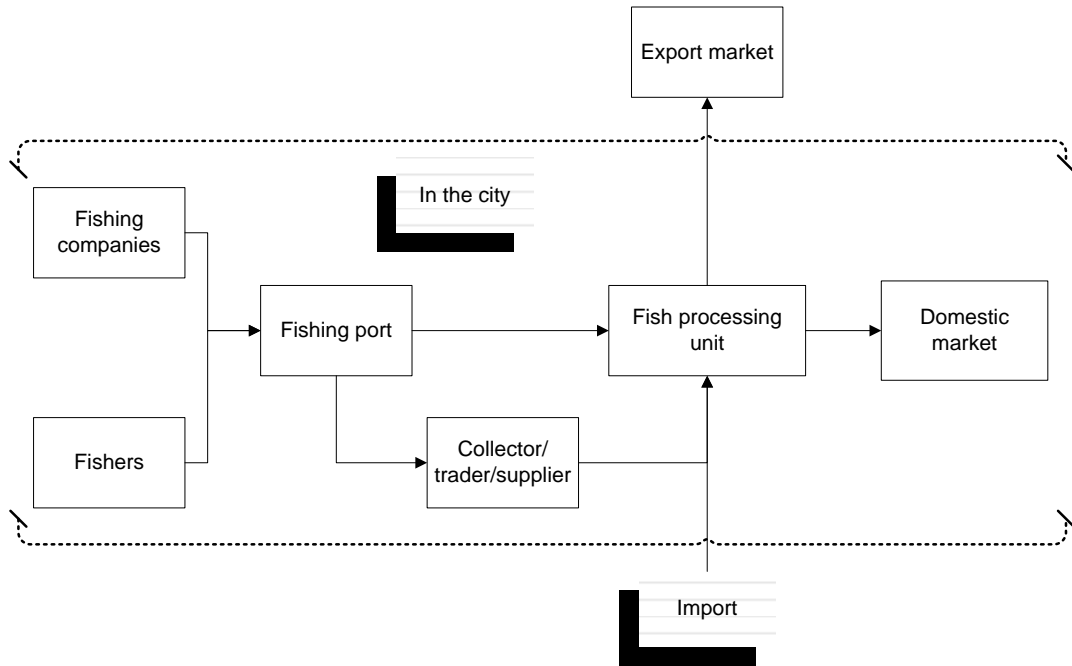
Overall, there are 60 fish processing companies (large-scale UPs) and two of them are no longer operating. The main products of UPI are various processed tuna, cob, and skipjack, both in the form of fresh, frozen, or canned fish. The city is the centre of the fish processing industry, particularly for tuna commodities. In addition to the large-scale fish processing industry, Bitung city also has a growing group of fish processing totalling 21.

The fish processing industry mostly processed fish for the export market. Fish exports continued to increase in 2010–2014, from 29,109.8 tons in 2010 to 32,574 tons in 2014. However, export volumes declined to 18,658.4 tons in 2015 and 15,800.4 tons in 2016. The new regulation related to fishery management, such as prohibition of transshipment and ex-foreign fishing vessels, created a raw material shortage for the industry.

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<sup>17</sup> Illegal, unreported, and unregulated (or IUU) fishing is a broad concept found in all types and dimensions of fisheries, on the high seas and in areas within national jurisdiction. It concerns all aspects of and stages in the capture and utilisation of fish. It may sometimes be associated with organised crime, <http://www.fao.org/iuu-fishing/background/what-is-iuu-fishing/en/> (accessed 22 May 2019).

**Figure 6.20: Fish Supply Chain Model of Tuna and Tuna-like in Bitung City**



Source: Author.

Two main policies directly impacted Bitung city’s fishing industry: (i) the Ministry of MAF Decree No. 56/2014 concerning temporary termination (moratorium) of licensing of capture fisheries business and (ii) the Ministry of MAF Decree No. 57/2014 concerning the termination or prohibition of transshipment activities. In addition, the UPI in Indonesia is dominated by traditional home-based UPI (accounting for 97.67%); modern units including this case study account for 2.33%. Therefore, supporting the growth of such modern UPIs is important.

The banning of foreign and ex-foreign fishing vessels, the government’s policy to fight illegal fishing, since 2014 has significantly impacted the fishery industry and the city of Bitung, as the region heavily relies on the fishery industry. Fish production even declined 59% in 2015 (to only 45.209 tons). Such situation impacted on the UPI that was having difficulty getting raw materials. As a result, processing units were forced to reduce the number of workers; some of them closed and did not operate anymore.

The decline in fish production will automatically reduce the industry's market share, which is marked by a decline in fishery product exports. To deal with the issues, the processing units imported raw materials from other countries and transported in from outside the region. Reassessment of current policy particularly by promoting the development of national fishery will be needed.

Based on the recommendation of the Regional Fisheries Management Organization, increasing the number and capacity of the national fishing fleet to exploit tuna resources would need support from the policymakers such as simplifying and accelerating the licensing

process. Empowering and increasing the role of national fishery companies<sup>18</sup> are needed to manage the upstream side of the tuna fishing industry.

The national fish logistics system<sup>19</sup> could be improved by strengthening the national tuna commodity business chain. This effort can be pursued by developing eastern Indonesia as a source of raw materials while strengthening the infrastructure for the fish processing industry and still maintaining Indonesia's western region as one of the centres of the fish processing industry.

## 6. Conclusion

Fishery plays an important role for Indonesia as a main source of animal protein and primary nutrition for most people, of main livelihood and income, and of foreign exchange for the country.

Despite being an exporter country, Indonesia is still behind other countries, particularly Viet Nam and Thailand even if Indonesia is the world's second-largest fish producer and there is potential to expand its production and markets. Its strong outward-looking policy must be in balance with its inward-looking policy orientation because of the rapidly growing new trend in fish import in the last decade.

The fishery sector received a big push when the current government clearly stated the need for the country to be with the 'world maritime centre' (*poros maritim dunia*) and issued Presidential Instruction No. 7 of 2016 on Accelerating the Development of the National Fisheries Industry. The strategy is expected to resolve the fundamental problems of fishery related to the lack of infrastructure of fishery production, the weakness in fish supply chain and logistics, the lack of fish quality, and less harmonious fishery policies.

Strengthening the fish business in the upstream sector should be prioritised to ensure the development of downstream industries. With the potential of fishery resources, Indonesia could become the world's fish barn (*lumbung ikan dunia*).

A few challenges need to be addressed in each supply chain:

- In the upstream (production) site

The lack of supporting production infrastructure, such as the lack of modern and well-managed fishing ports, still emerges. Most or more than 91% of the total fishing ports are of lowest class or traditional and nature based. The fishing ports also lack facilities such as cold chain systems. A national fish logistic system should be implemented to optimise the use of fishery resources and to ensure food safety and food security.

The main production facilities are also weak. Most of the fishing vessels are small scale (87.6% are under 10 GT) and dominate coastal-based fishery. This fishery is also challenged

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<sup>18</sup> State-owned enterprises: *Badan usaha milik negara* (BUMN).

<sup>19</sup> National Fish Logistic System: *Sistem Logistik Ikan Nasional* (SLIN).

by the declining trend in coastal-based fishery resources. The promotion of middle- to large-scale fishery (offshore fishery), which is serviced by only 1.71% of the total fishing vessels (with less than 30 GT), is needed. In the meantime, the training of fishers and managers for the medium- to large-scale fishery is needed to ensure the availability of human capital to manage the fishery.

As shown by the case of anchovies and lobster fishery, two examples of coastal-based fishery, it is important to enhance proper fishery management to ensure the sustainability of the fishery and community livelihood. Meanwhile, there is still opportunity to expand fishery to the offshore.

In terms of mariculture, particularly seaweed culture, the problems of good seed quality and occurrence of diseases, such as *ici-ici*, are still emerging. Therefore, a seaweed seedling system and/or centre that can produce good quality and superior seeds is important.

- In the midstream (handling and processing) site

The lack of a cold chain system that impacts the quality of fish products still emerges. The rejection of seafood products by the market is mainly due to quality issues. Therefore, implementing and improving a national fish logistic system is important to secure and improve the quality and safety of seafood products. Emerging logistical problems result in high-cost fishery, low quality of products, and big price disparities. The improvement could be implemented along the supply chain of seafood products – from handling in fishing boats, to landing places, to the processing units until the final consumers.

The case of anchovies and seaweed shows that most fish products are processed in a traditional way (dried/salt, boiled, and paste). Value-added products must be promoted to respond to the changes in the consumption and lifestyle of the consumers.

High-value products could be promoted by producing live fish, such as in the case of lobsters. In fact, many mariculture products, such as grouper, also keep their high value added by being sold alive. Therefore, it is important to improve the handling and transportation system from the producer to the consumer.

- In the downstream (market) site

The fish market is open and growing for the domestic and export markets. Indonesia's domestic consumption trend shows that fish consumption is still growing. In addition, the export market of Indonesian seafood also increases, even though growth has been slow since 2015 due to various policies that impact on the processing industries that could not achieve their normal producing capacity.

The competitiveness of Indonesia's seafood products is still weak. As an exporter country, Indonesia is behind other countries, such as Viet Nam and Thailand in terms of value-added products. While Indonesia is the world's second-largest fish producer, there is still potential to expand its production and its markets.

The role of the traditional markets in Indonesia's domestic market is obvious. The traditional markets provide various fish products – marine, freshwater, and processed fish – that are originally from various regions. As perishable goods, fish products easily get spoiled due to the lack of cold chain systems. Therefore, the distribution and the cold chain management systems in the traditional market should be improved.

Despite these challenges, fishery products can potentially support Indonesia's economic growth as a source of livelihood of fishers.

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