

Mapping performance of the fishery industries innovation: A survey in the North Coast of Java

M Yusuf^{1*}, A M Legowo², A N Albaarri², Y S Darmanto³, T W Agustini³ and A I Setyastuti⁴

¹Department of Food Technology, University of Muhammadiyah Semarang, Jl. Kedungmundu Raya No.18, Kedungmundu, Tembalang, Semarang City, Central Java, Indonesia

²Department of Food Technology, Faculty of Animal and Agricultural Sciences, Diponegoro University, Jl. Prof. H. Soedarto, S.H. Tembalang, Semarang, Central Java, Indonesia

³Department of Fishery Product Technology, Diponegoro University, Jl. Prof. H. Soedarto, S.H. Tembalang, Semarang, Central Java, Indonesia

⁴Fisheries Science Programe, Faculty of Fisheries and Marine Science, University of PGRI Ronggolawe Tuban, Jl. Manunggal No. 61Tuban, East Java, Indonesia

*Email: m.yusuf@unimus.ac.id

Abstract. This study aimed to put the performance indicators of industry innovation fisheries which would be used as inputs to create innovation strategies in order to win the market competition, especially in USA. Survey and in-depth interviews were conducted on 10 industries with shrimp, tuna and crab commodities representing the fishery industry in Indonesia to USA export destination. The result of mapping performance of innovation indicators of Indonesian Fishery Industry resulted the 10's strategies alternative to win the market. Based on survey result indicate that "the regulation of catch and/ or harvest of cultivation factor" is considered the weakest factor in develop innovation with a score of 3.3, while the international trade factor are considered as the strongest factor in developing innovation development with scores 5.0. Aggressive strategy by strengthening the strength owned by the internal industry was by always looking at the opportunity, so that they could take the opportunity to win the market competition at the right time.

Keywords: Mapping, Indonesian Fishery Industry, Innovation.

1. Introduction

Indonesia is one of the world's largest exporter of fishery commodities, the average export value of fishery products from 2012-2016 has increased every year. The total potential of fish resources in Indonesia reaches 21.05 million tons by 2015 [1]. The export destination of Indonesian fishery products is USA with percentage of export value of 9.5% / year, EU of 6.0% / year and China of 3.2% / year during



2012-2016 [2]. USA is still the largest exporting country of Indonesian fishery products with a value of 1,843,813 (US \$ 1,000) by 2014 [3]. Fishery exports in 2014 reached 1.27 million tons or increased by 1.34%, while fisheries export trend in 2008-2014 increased by 6.11% and in 2014 grew by 3.69%. The main commodities of Indonesian fishery exports are shrimp, tuna (big eye, yellow fin, albacore and blue fin), tuna (little tuna), skipjack, and crabs [4].

One of the determinants of the increase in export value of Indonesian fishery products is the industry's vision that is always oriented to the market. Market orientation focuses on consumer desires, competitiveness, superiority, and integrity of all functions or performance that exist in a company to create an innovation that is able to compete in the market [5-8]. Innovation can be applied to various aspects that become indicators of the performance of a fishery industry as proposed by [9], both from ecological, economic and social aspects. Knowing or mapping performance indicators of a fishery industry innovation is very important to do because from the mapping results, it can be known about the strengths, weaknesses, opportunities, and threats of a fishery industry as input materials to create a strategy to win the market competition. This study aims to put the performance indicators of industry innovation fisheries which will be used as inputs to create innovation strategies in order to win the market competition, especially in the USA.

2. Materials and methods

Data sampling was conducted on 10 Indonesian fishery industries i.e. Shrimps (3 industry), Tuna (3 industry), and Crabs (4 industry) were spread on special areas on capital of Jakarta, west java, central java and east java .Site visits to direct observations and depth interviews were conducted on the performances indicator of fishery industries. Direct observations and depth interviews carried out with major industry actors and their stakeholders of fishery industries. The samplings were conducted during April-July 2017. Furthermore, the performance indicators were compiled by the rated a score of (1-5), where the value 1 was very weak performance / not well-performing / not effective and 5 very strong performance / well-performing / effective. The questionnaires of fishery assessment standards Performance Indicators (FPIs) adopted from [9] and has been modified.

Indonesian Fishery Industries (IFI) performance data were analyzed by descriptive and presented in the chart radar, a graphical method of displaying multivariate data in the form of two-dimensional graphs of variables measured to show the advantages and disadvantages of factors. The radar graphs with geometric projection method were to express the distribution of the weakest and the strongest factors in a multidimensional space. SWOT analysis was used as a method to map the attribute value as a comprehensive representation of the performance of the industry's competitiveness.

3. Results And Discussions

The results of the research survey and secondary data study showed that the fishery industry in Indonesia was dominated by the industries which exported shrimp and lobster (3 industries), tuna (including skipjack and little tuna) (3 industries) and crabs (4 industries). Table 1 showed the performance of the Indonesian fishery industry.

Table 1.Indicators of Indonesian fishery industry.

No	Aspects	Indicators
1	Ecological	The availability of raw materials
2		Regulation of the catch and / or the harvest of aquaculture
3		Infrastructure handling and the fish landing
4		Risk of product damage
5	Economics	International trade
6		Access and market network expansion
7		Adaptation to regulations
8		Adaptation to market trends
9		Protection against competitors' products
10		Product quality and safety
11		Product development
12		Consumer service
13		Distribution control
14		Financial capital
15	Social	Social improvement of workers' welfare
16		Training on quality improvement of workers
17		Workers' health facilities and infrastructure
18		Sanitation and hygiene facilities
19		Corporate Social Responsibility (CSR) program
20		Increased environmental economic value

The performance of the fishery industry in Indonesia could be known from the resources of strengths and weaknesses, opportunities and challenges covering all aspects from the ecological (fish stock & sustainable), harvest sector performances, and social (post-harvest sector performances). The details of the performance positions of fishing industry in Indonesia were examined from factors derived from these three aspects as adopted from [9]. For more details, it could be seen in Figure 1.

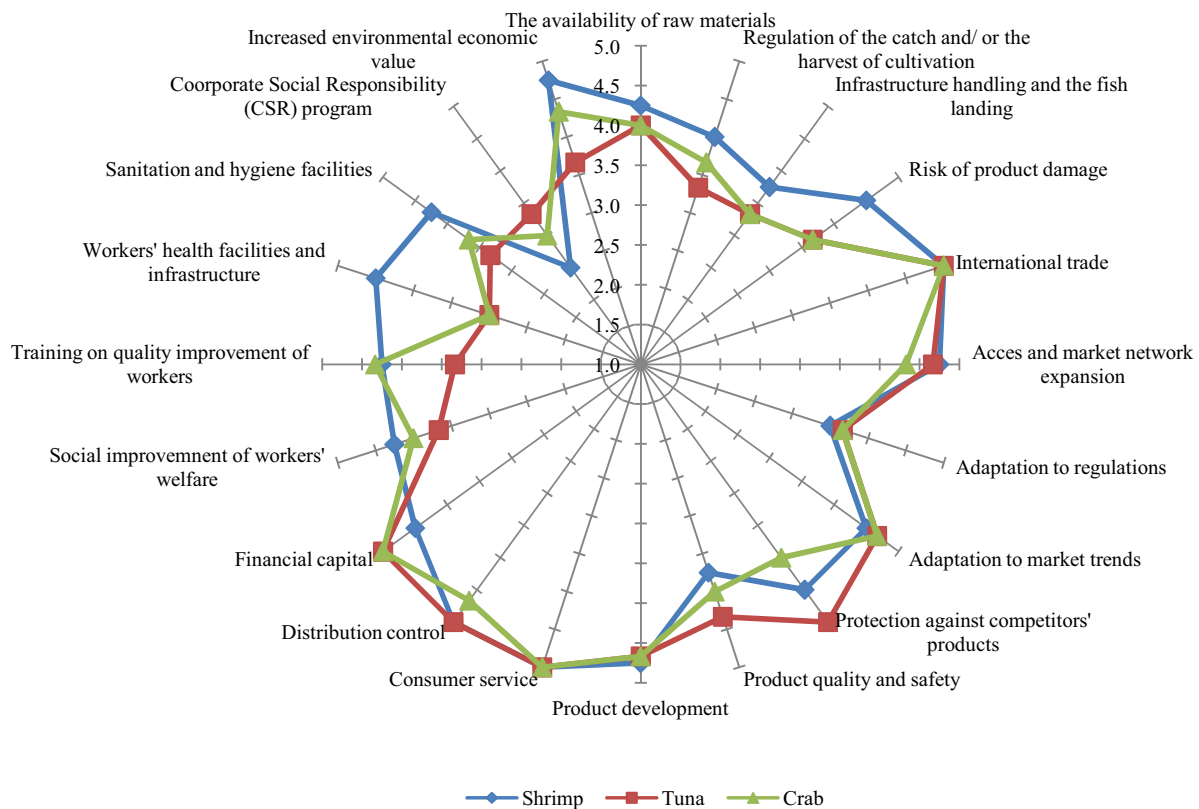


Figure 1. Mapping performances innovations of Indonesia Fishery Industry.
Value : average from 3 shrimps industries, 3 tuna industries and 4 crab industries.

3.1. Ecological factors,

Ecological factors are included the availability of raw materials and supply chains or distribution channels of fishery industry raw materials and the catch or harvest regulations. The fishery industry in Indonesia was a complex system that could be described as upstream and downstream systems. Upstream system as a provider of industrial raw materials in the form of fish from the catching sector with production volume reached 6.52 million tons in 2015 and aquaculture with production volume reached 14.53 million tons in the same year [1]. The shrimp and lobster industry in Indonesia was excellent for the export market in the USA, during 2010-2014 Indonesia's shrimp exports to the USA averaged 16.92% each year with a value of 32.42% recorded in 2014 value of Indonesia's shrimp exports to USA reached 1,283.880 (US \$ 1000) [3]. The increase of aquaculture fishery could be influenced by several factors such as continuous demand factor by industry and raw material supply as well as regulatory factors related to fishing. The availability of raw materials for shrimp industry was not very influential when compared with tuna and crab industries. This was because the shrimp was one of the cultivated commodities that could be self-reproduced, so it was not so affected by the existence of ecological issues such as over fishing, Illegal Unreported Unregulated (IUU) Fishing, as well as other environmental issues. Lobsters were generally marketed in fresh form while shrimp was in the form of frozen. The types of shrimp exported in Indonesia were generally in the form of: Whole / Head On (HO), Head Less (HL), Peeled, Peeled Tail On (PTO),

Peeled and Deveined (PND), Peeled Undeveined (PUD), Butterfly, or a diversified product under the name of “Ebi Panko” (Breaded Shrimp).

Indonesia tuna export to USA during 2010-2014 average per year reached 4.15%, this value was smaller when compared to the shrimp exports. The export value of tuna to USA in 2014 was 128,297 (US \$ 1,000) [3]. Tuna products from Indonesia were generally marketed in the form of fresh tuna, frozen tuna or processed and preserved tuna such as whole, gilled and gutted, fillets, steaks, sticks, loin, pocket and canned variants. The ecological factors of development of the world's tuna industry faced global issues such as Illegal, Unreported and Unregulated (IUU) fishing, environmental degradation, climate change, competition with other tuna exporting countries, and trade barriers [10]. Reported by [11], about 23 stocks of tuna above 60% were fully exploited, 35% were overexploited or exhausted and the rest was exploited but very few were reported. Considering this fact, a Regional Fisheries Management Organizations (RFMO) was established, specifically the tuna 5 RFMO had been established, namely IOTC (Indian Ocean Tuna Commission), CCSBT (Commission for the Conservation of Southern Bluefin Tuna), WCPFC (Western and Central Pacific Ocean Highly Migratory Fisheries Commission, IATTC (Inter-American Tropical Tuna Commission (Eastern Pacific Ocean), ICCAT (International Commission for the Conservation of Atlantic Tunas) aiming to ensure tuna stocks above Maximum Sustainable Yield (MSY) [12]. As the actions to the issues, tuna fishery industry in Indonesia had made several ideas such as: 1). Adjustment of Tuna Capture Targets to be included in the RFMO category, recorded in 2011 there were 800 units (45.36%) ships measuring 100-200 GT, 500 units (28.14%) vessels measuring 60-100 GT and 295 units (16.60%) measuring 30-60 GT. 2) Utilization of registered fishing equipment that was Longline as many as 1414 units (79.57%), purseine as much as 166 units (9.34%) and others such as pole and line (1.01%), gill nets (0.11%), support vessel (3.60%), Unknown (6.36%) [10].

Crab was one of the important fishery export commodities in Indonesia with the aim of its largest export country, USA. Crabs in Indonesia were generally exported in the form of pasteurization in cans. Supply chains and distribution channels of crab industry in Indonesia were generally managed directly by the industry by way of having a crab catching vessel leased to local fishermen, or by establishing mini plants in the crab producing areas that receive crabs from local fishermen. In the mini plant, the crab raw material was cleaned, steamed and then peeled and stored into the cooler before being sent at the plant (main plant) to be canned. The operations of capture and / or crab processing in Indonesia were spread in the North of Java Island, East Sumatra, Kalimantan and South Sulawesi. The northern territory of Java Island dominated for the crab industry, this was due to the ease of access to capture, distribution and other economic activities that supported the industry. This phenomenon made the tightening of industrial competition that led to the scarcity of raw materials, industrial crab efforts in meeting the needs of industrial raw materials by raising the purchase price at the level of fishermen or collectors but with the high purchase price of the treated industries also apply quality standards / quality products strict. It's similar type with [12], the raised price of raw material caused by the competitions of raw materials.

3.2. *Economic factors*

What became the serious concern to the perpetrators of the Indonesian fishery industry in the economic factors were the fishing and fish landing infrastructure, product quality and level of food security, and adaptation to market trends, but the other economic factors could not be ruled out. The fish handling and landing infrastructure were the first factor because of the good handling of crops or catches made good end product quality, so that the price of commodity of fishery industry was also higher. In the shrimp and crab industry in Indonesia, generally handling and harvesting infrastructure level was good category meaning that the company had a good understanding of the quality and standard of good product quality by applying a product quality assurance system such as Good Manufacturing Practices (GMP), Good Handling Practices (GHP), or Hazard Analysis Critical Control Point (HACCP). While in the tuna

industry, the category of fish handling and landing infrastructure were still in the middle, this was because the human resources still had low understanding about the quality of the product, so that the level of application of quality assurance and food security system was still low.

From a food safety standpoint, shrimp and crab commodities faced the greater issues related to food safety products. The use of chloramphenicol (CAP) was a very strong issue for the shrimp and crab industries. Chloramphenicol (CAP) was widely used by shrimp farmers in Southeast Asia including Indonesia, and this was what caused the failure of Indonesian shrimp exports to various countries in the world [13]. As for the crab industry during 2002 to 2013, there were 381 cases of rejection of Indonesian crab exports to the USA where 171 cases were dominated by Chloramphenicol [14]. CAP was an antibiotic used in shrimp culture that had accumulated properties in the body when we ate the shrimp or other fishery products that had been exposed to CAP. If CAP accumulated in the body for a long time, it would cause anemia and cancer [15]. The various efforts could be made to minimize the CAP content of shrimp and crabs such as the process of shrimp depurization before being processed or sent to the factory [13], but this process required greater production time and cost. During this time, the shrimp and crab industry had made efforts to minimize the CAP by way of product assessment in the laboratory either in their own factory or a competent laboratory to issue the Product Health Certificate as one of the export requirements. The trends of world trade, especially fishery products and their processed products would remain a commodity that could compete with food commodities (meat, milk, eggs, bread and others) with market share of about 31% until 2024 [16]. The price of fishery products was also influenced by demand and supply factors, including production and transportation costs, also including substitutes such as meat and flour. The changes in diet and lifestyle, the increased income, and consumer welfare also affected the demand for fishery products.

3.3 Social factors,

Consisting of improving workers' welfare, training on quality improvement of workers, health facilities and infrastructure, sanitation and hygiene facilities, Corporate Social Responsibility (CSR) programs, as well as improving the welfare of communities around the industry. Some points that needed to be improved by Indonesian fishery industry were especially in health worker facility and infrastructure, sanitation and hygiene facility and CSR program. Sanitation and hygiene facilities needed to be improved due to the basic eligibility requirements for establishing a quality assurance and product safety system (HACCP system). Based [17], the hygienic practice requirement was an essential feasibility program essential for the fishing industry and fish processing prior to the HACCP implementation. During this time, the Indonesian fishery industry to improve the sanitation and hygiene levels of production sites in cooperation with the competent authorities to assess the sanitary and hygienic levels of production sites for a certain period depending on the scale of sanitation and hygiene assessment. For instance, the level of perfect assessment could be done once a year, the medium level could be done every 6 months, and once a low rate was done every 3 months. The point of Corporate Social Responsibility (CSR) of Indonesian fishery industry was still low, but indirectly for the existence of the fishery industry could improve the welfare of the community around that was with the growth of other economic activities that were able to support the existence of the fishery industry.

3.4. SWOT Analysis

The results of mapping the performance of the innovation of the Indonesian fishery industry produced several notes for Strength, Weakness, Opportunities and Threats for the development of Indonesian fishery industry strategy to be able to compete in global markets, especially USA. The following was SWOT analysis of Indonesian fishery industry. Table 2 showed the SWOT of the above industry performance indicators.

Table 2.SWOT analysis of the performance of the Indonesian fishery industry innovation.

No	Factors	PerformanceIndicators
1	Strength – 1 (S1)	International trade
2	Strength – 2 (S2)	Access and expansion of the market network
3	Strength – 3 (S3)	Adaptation to market trends
4	Strength – 4 (S4)	Product development
5	Strength – 5 (S5)	Control distribution
6	Weakness – 1 (W1)	Fish handling and landing infrastructure
7	Weakness – 2(W2)	Workers' health facility and infrastructure
8	Weakness – 3(W3)	Sanitation and Hygiene Facilities
9	Weakness – 4(W4)	Training of workers' quality improvement
10	Weakness – 5(W5)	Corporate Social Responsibility (CSR) Program
11	Opportunities – 1 (O1)	Adaptation to theregulations
12	Opportunities – 2(O2)	Increasingenvironmentaleconomicvalue
13	Opportunities – 3(O3)	Product quality and safety
14	Opportunities – 4(O4)	Consumer service
15	Opportunities – 5(O5)	Increasingworkerswelfare
16	Threats – 1 (T1)	The availability of raw materials
17	Threats – 2 (T2)	Regulation of the catch and / or the harvest of aquaculture
18	Threats – 3 (T3)	Risk ofproductdamage
19	Threats – 4 (T4)	Financial capital
20	Threats – 5 (T5)	Protectionagainstcompetitors' products

Table 3.Strategies Alternative.

Strategies alternative		Code
SO strategies		
1.	Always follow the international trade regulation by enhance the resources owned.	S1O1
2.	Expand the market access by prepared the quality products, product development and improving customers service.	S234O34
WO strategies		
3.	Improving the infrastructure supporting industry and workers ' health, sanitation and hygiene facilities to produce the high quality product.	W12O3
4.	Training of workers' quality improvement to produce the high quality and safety based on export standard.	W4O3
5.	Enhancing the CSR program to increasing environmental economic value.	W5O2
ST strategies		
6.	Updating the international trade with connecting the regulation of the catch and / or the harvest of aquaculture products.	S1T2
7.	Controlling the distribution strat from the availability of raw materials until risk of product damage and protection against competitors' products.	S5T135
8.	Enhancement of financial capital to expand the market networks	S2T5
WT strategies		
9.	Improving the fish handling and landing infrastructure to ensure the availability of raw material	W1T1
10.	Enhancement of financial capital to improving the fish handling and landing infrastructure, workers' health facility and infrastructure, sanitation and hygiene facilities and training of workers' quality improvement to minimize the risk of product damage.	W1234T34

4. Conclusions

The Indonesian Fishery Industry that exported to the USA faced various problems both from the internal industry itself and the external from world market trend, especially USA. The lowest performance indicators value are adaptation to regulations, social improvement of workers' welfare, workers' health facilities and infrastructure, the sanitation and hygiene facilities and CSR programs. The highest performance indicators value is international trade, adaptation to markets, the product development, and distribution control. The strategy adopted by the Indonesian Fishery Industry to maintain and improve the competitiveness in the USA market was by means of aggressive strengthening Strength which was owned by the internal industry by always looking at the Opportunities that existed, so that later on the right time could take the opportunities for winning the market competition.

Acknowledgement

This research was funded by Ministry of Research, Technology and Higher Education with Post Doctoral Scheme Project in 2017.

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