Indonesian consumer perception of food safety system in fish supply chain

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Abstract. Fish is one form of alternative food because fish can replace the role of beef as a source of animal protein. Therefore, food safety in fish need to be applied because fish production environment is a potential source of danger for food, among others: pathogen, parasite, and chemical contaminant. This study aims to determine consumer perceptions of the importance of implementation of food security in the supply chain of fish. The data were collected through questionnaires distributed to 206 respondents. The questionnaire consists of two parts: (1) identities of respondents and (2) consumer perceptions of fish food safety. Data processing is done by using the distressed statistic, mean and standard deviation. The results showed that the food safety aspect of fish is important for consumers. Other food safety factors affecting consumers are certifications, location, distribution process and food additives. Based on calculation of mean value, it is known that the priority of food safety interest according to consumer perception is about the freshness attributes of fish, which is followed by hygiene of fish sellers, fish nutrition, types of fish, location of fish origin, Location of fish sales, the seller's understanding of the fish being sold, the type of transportation used for fish delivery.

1. Introduction

Food safety is the main requirement of food to be consumed by each individual. Foods that are safe to eat are foods that are beneficial to the body, no negative impact on the short or long term. Food negative impact (incidence of food safety) occurring in some countries, such as China [1,2], Hungary [3] and Europe [4]. The incident is a driving factor for consumers to be more aware of food safety functions and more selective in purchasing food products [5]. Therefore, currenly, the issue of food safety is a major concern because of the development of science that can increase consumer awareness to consume safe food [6].

Food safety is the basic right of all consumer. Therefore, the Government controls and regulates it specifically through the establishment of different laws, regulations and standards between countries, depending on the level of income and technological development [7]. Food safety institution in each country has the legality and standard of food safety in accordance with the internal conditions of the country. In Indonesia, food security is a necessary condition and effort to prevent food from possible biological, chemical and other contamination that may disturb, harm and endanger human health (Undang- Undang No 7- 1996).

One food product that is at high risk of harmful bacterial contamination is fish or fish-based food products because the fish is easily decayed in the supply chain system [8]. This is triggered because food security in Indonesia for fish still emphasizes traditional pattern of supervision where emphasis

on quality control and food safety is done through final product testing has not included risk factors into it [9]. On the other hand, fish or food made from raw fish is one form of alternative food. Called alternative food because fish can replace the role of beef as a source of animal protein. Fish can be processed into various products such as meat, such as fish meatballs, fish nugget, etc. Therefore, food safety in fish need to be applied because the fish production environment is a potential source of food hazards, among others: pathogens, parasites, and chemical contaminants [10].

In the context of supply chains, fish have long supply chain structures. There are several actors in the supply chain process from the start to the consumer.

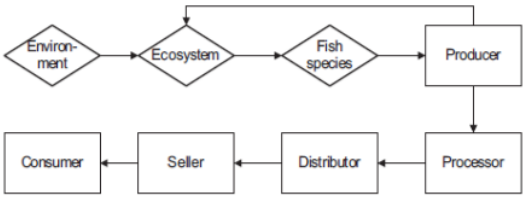

Figure 1. Fish supply chain [11].

In the supply chain structure of fish (fig 1) there are five actors who act as fish carriers from sea / breeders to consumers. Every actor in the supply chain, fish experience value addition process. Therefore, the food safety system in the supply chain of fish is very necessary to maintain the quality of fish. Moreover, the fish security system is needed to equalize the overall perception of supply chain actors. This is because the actors in the supply chain of fish have different points of view, such as fishermen, processor, distributor / retail, HORECA (hotel, restaurant catering [12].

Table 1. Stakeholder point of view of fish supply chain [12].

Stakeholder	Interests	Worldviews
Fisherman	• Income • Continuity of company, minimize of cost. • Personal/ cultural • Good enabling conditions	• Being a fisher is a strong part of identity. • Compliance driven. • On board strong bonding between personel. • Nature is seen to be a mystery.
Processor	• Selling more sustainable fish in agoood price • Aware consumers • Marketers of retail integrate sustainability into their marketing strategy. • Competitors also become active while maintaining a competitive advantage • Access to fisheries resources	• Sense of pride in profession • Intrinsic belief in sustainability and building sustainable relationships that meet the needs of all stakeholders • Challenging the whole system
Retail	• Protecting brand and reputation • Need for control over the supply chain • Need for flexibility to safeguard reputation enforcement	• Orientation is mainly profit-driven, avoiding reputation risks • Limited opportunities are being sought • Emerging examples of care-driven and synergistic orientation
HORECA	• Quality of fish • Long-term relationship with supplier	• Mainly profit-driven orientation • Some niche care-driven examples

These different perspectives encourage every stakeholder in the fish supply chain to undertake a similar mechanism to deliver quality food to consumers (table 1). Therefore, this study aims to determine consumer perceptions of food safety systems in the supply chain of fish. These results are expected to strengthen the implementation of food safety systems in the supply chain of fish.

2. Research methodology

This study was conducted by distributing questionnaires from January to February 2018 in 206 respondents. The distribution of questionnaires was conducted in four provinces, namely East Java, Central Java, West Java and Bali, through online system with google form. The sampling technique used is simple random sampling. The questionnaire used in this study consists of three parts, the first part aims to determine the identity of respondents consisting of sex, income, education, age and employment. The second part aims to determine consumer perceptions of food safety on the fish to be consumed. The third section aims to determine consumer perceptions of fish food security at every stage of the supply chain. Questionnaires were prepared using Likert scale with scale of 1- 4, i.e. 1: not important, 2: quite important, 3: important and 4: very important. We used six questions on the questionnaire to find out consumer perceptions of the food safety of fish in the supply chain. The questions we use in the questionnaire are as follows:

- Location of fish origin (P1)
- Freshness of the fish (P2)
- Location of fish sales (P3)
- Types of fish (P4)
- Nutritional content of fish (P5)
- Hygiene of fish sellers (P6)

3. Result and discussion

Characteristics of respondents show the identity of respondents who are distinguished by sex, age, work as shown in table 1.

Table 2. Characteristics of respondents.

		Percent
Gender	Male	42
	Female	58
Age (year)	20- 25	28
	26- 30	28
	31-35	9
	36-40	10
	>40	26
Education	Low	24
	Medium level	58
	High level	19
Type of work	Lecturer/ Teacher	11
	Private employees	43
	Government employees	12
	Entrepreneur	34
Gross household income	<1000000	13
	1000000- 3000000	28
	.3000000	59

Table 2 shows that the majority of respondents are women (58%), as they are more concerned with food health issues. Most respondents were young, 20 to 25 years old (28%) and 26 to 30 (28%), followed by more than 40 (26%), 36 to 40 (10%) and 31-35 years (9%). The education level of the medium level dominates the respondents (58%) followed by low (24%) and high-level (19%). Most of

the respondents are private employees (43%), followed by self-employed (34%), government employees (12%) and lecturers / teachers (11%). In terms of RMB, 59% has RMB over 3000000, followed by RMB 1000000 to 3000000 (28%) and less than 1000000 (13%).

Table 3. Consumer perceptions of fish safety in the supply chain.

Attribute research	NI	QI	I	VI
P1	7	36	139	24
P2	10	4	145	47
P3	8	40	137	21
P4	2	34	153	17
P5	9	22	148	27
P6	9	4	155	38

NI: Not important, QI: Quite important; I: Important; VI: Very important

Table 3 shows respondents' perceptions of fish food safety in the supply chain. The table indicates that assuming that the food safety of fish in the supply chain is important. It can be seen from respondent's answer to every attribute of research. Most respondents (more than 50%) answered important for each attribute of the study. For example, in the P1 attribute (location of fish origin) of 139 out of 206 respondents (68%) is important to consider. At attribute P2 (freshness of the fish) of 145 out of 206 respondents (70%) also considered important to consider. The condition also occurs in attributes P3, P4, P5, and P6.

Currently, consumers are more careful in choosing foods to buy and consume [13]. Therefore, consumers are very concerned about the food security of fish to be consumed. This is triggered by the contaminated food at one stage of the supply chain, because it is not obedient to the rules on food safety. For example, in Vietam, the practice of fish distributors at ports and fish markets is considered to be at high risk of being contaminated because it does not meet Vietnam's microbiological standards [14]. The discovery of tapeworms in canned fish in Indonesia. Therefore, strategies need to be taken to reduce food safety risk in the supply chain by improving workers' capabilities, maintaining equipment cleanliness and distribution systems [15].

Table 4. Ranking of consumer perceptions of fish safety in the supply chain.

Attribute research	Mean	Sd	Rank
P1	2.87	0.643	5
P2	3.11	0.657	1
P3	2.83	0.652	6
P4	2.90	0.527	4
P5	2.94	0.641	3
P6	3.08	0.609	2

Table 4 shows the average scores of respondents' attention to food safety systems in the fish supply chain. In this study, the selected respondents were the final consumers in the supply chain of fish. The results of these calculations show that consumers are the most concerned about the freshness attributes of fish, which is followed by hygiene of fish sellers, fish nutrition, types of fish, location of fish origin, Location of fish sales, the seller's understanding of the fish being sold, the type of transportation used for fish delivery. These results indicate that freshness of fish is a major aspect for consumers when choosing fish for consumption. This condition is due to freshness of fish is one indicator of quality fish.

4. Conclusion

The results showed that consumers have a perception that it is important to implement food safety system in the supply chain of fish. Implementation of food safety is needed to equate perceptions on the overall stakeholder in the supply chain of fish that have different interests. With the

implementation of food safety system, it is expected that consumers' interest to obtain quality fish can be fulfilled. However, there are still limitations in this study. This study only discusses consumer perceptions of the food safety system on the supply chain of fish, so it can be developed to other areas. Development of the research area can be done by measuring food safety risk in fish supply chain using various methods, eg FMEA, QFD or probabilistic method (Monte carlo, Bayesian).

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