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Food Safety and Halal Food Risks in Indonesian Chicken Meat Products: An Exploratory Study

Hana Catur Wahyuni^{1,2}, Iwan Vanany¹, Udisubakti Ciptomulyono¹

¹Industrial Engineering, Institut Sepuluh Nopember (ITS), Indonesia

²Industrial Engineering, Universitas Muhammadiyah Sidoarjo, Sidoarjo, Indonesia
(hanacw@umsida.ac.id)

Abstract: Food safety and Halal risk are important aspects of food quality. Food safety affects human health, while Halal affects compliance with Islamic law. This study aims to explore food safety and Halal risk of Indonesian chicken meat products. A cases study of two companies is presented. Data was collected through interviews and risk analysis. Critical factors and processes in food safety and Halal risk are identified. This study aims to better understand the extent of food safety and Halal risks, the critical points, the critical processes, and integration of risk management of food safety and Halal for chicken meat products.

Keywords: food safety, halal, risks, and integration.

I. INTRODUCTION

Food safety and Halal are two aspects of concern for Muslim consumers when choosing food and beverages and for consumption. In terms of food safety, most consumers are generally aware of biological contamination risks. Many infections are caused by food contaminated with Salmonellosis, Escherichia coli, Listeriosis, and others [1]. In the supply chain context, food can be contaminated at various points, such as from raw materials, the manufacturing process, food storage and distribution [2]. Food safety is regarded as a problem in the supply chain because partners will face problems over actions that are not done [3].

Halal assurance is also a major consideration for Muslims. Halal can be defined as any thing or actions that are permissible under Islamic law contained in the Qur'an and Hadith [4,5]. With regards to food, Halal assurance ensures that food is fit for or permitted for consumption by Muslims. In the supply chain context, Halal assurance requires strict control of both raw materials and the manufacturing process. Halal labelled foods reflect that the ingredients used contain no forbidden, unclean and toxic substances [6]. However, in reality, there are violations of the concept of Halal. Nonconformity with Halal practices are seen with the presence of Halal logo forgery by non-Halal certified companies which threaten the reputation, integrity and authenticity of the industry as well as make it difficult for consumers to determine the authenticity of goods [7,8].

In the context of the supply chain, corporate participation is needed to manage risks in order to produce

better food products by providing supervision of food safety and Halal assurance in logistic processes [9]. It is important to reduce risk factors in the early stages (raw materials or livestock) as it can reduce the burden of contamination at the food processing stage [10].

In previous studies, risk management was done separately on food safety and Halal assurance. Several studies on food safety risk assessment have been conducted through FMEA (Failure Mode Effects Analysis) [e.g.,11], Monte carlo [12] and Bayesian [13,14]. Whereas Halal risk studies used models of management and the identification of critical factors in order to assess Halal assurance [15].

A new approach is needed to integrate risk management of food safety and Halal assurance. This could improve efficiency and effectiveness across the food supply chain. Integration of risk management in the business process will enable higher company performance and company targets can be achieved using minimal labor and time to produce higher quality products [16,17].

In Indonesia there have been few studies of food safety and Halal assurance risks in chicken food products. The aim of this study is to better understand food safety and Halal assurance risks, the critical points of risk, the critical processes, and integration of risk management of food safety and Halal assurance for chicken food products.

II. METHODOLOGY

In this study, the risk to food safety is based on food safety management system ISO (International Organization for Standardization) 22000-2009, i.e. physical, chemical and biological contamination risks. As for Halal risk, it is based on seven attributes that guarantee food is Halal, i.e. location, facilities and equipment, labor, supplementary food, slaughtered animal species, packaging materials, storage warehouse [18].

The business process refers to the SCOR (Supply Chain Operations Reference). From the supply chain perspective, SCOR organizes a strategic process that connects companies to consumers, i.e. plan, source, make, deliver and return [19]. However, in this study, the SCOR concept entails only three processes, i.e. source, make, and deliver. The plan and return are not included because the risk for both these processes is smaller than for the other three.

Indonesian chicken food products were selected for the case study because the Indonesian food industry has experienced several problems which require solutions to

reduce the risks to food safety [20,21 22] and Halal assurance [23].

This research is qualitative with the data collection based on a series of interviews and focus groups [24]. This research was done in two stages, namely interview and risk analysis .

Stage 1

This study involved data collection from two companies. An interview was conducted with the first company in October 2017 and the second company in November 2017. Interviews were conducted individually and face-to-face with one respondent from each company. The respondents were those responsible for the management of food safety and Halal assurance and had extensive knowledge of and experience in this subject. See Table 2.

The interviews involved structured questions, which consisted of two parts: respondent details (part I) and food

safety and Halal risk management systems at the company (part II).Interviews were conducted with the aim of supplementing data not obtained through the questionnaire or to clarify information obtained from the questionnaire. Part II of the interviews included 15 questions, comprising eight questions about food safety risks, five questions about Halal food risks, and two questions about the integration of food safety and Halal risk management (Table 1).

Stage 2

This study also conducted risk analysis which refers to the concept of Risk Exposure or Risk Score [25].

Risk Exposure Value :

= Risk Impact index x Risk Probability index

With Risk Impact levels: catastrophic (4), critical (3), marginal (2), negligible (1) and Risk Probability levels: High probability (4), Medium-high probability (3), Medium-low probability (2), Low probability (1) .

TABLE 1
INTERVIEW QUESTIONS

Aspect	Questions
Food safety	What is the food safety system used by the company? (Q1)
	Which parts / processes are a source of risk to food safety ? (Q2)
	What is the biggest risk to food safety that needs to be the main concern of the company? (Q3)
	How does the company control physical risk? (Q4)
	How does the company control chemical risk? (Q5)
	How does the company control biology risk? (Q6)
	How does the company control food safety in the transportation and distribution systems? (Q7)
	What is the company's strategy to minimize risk to food safety? (Q8)
Halal assurance	What is the Halal certification system used by the company? (Q9)
	Which parts / processes are a source of risk to Halal assurance? (Q10)
	What is the biggest risk to Halal assurance that needs to be the main concern of the company? (Q11)
	How does the company control Halal assurance in the transportation and distribution systems? (Q12)
Integration of food safety and Halal risk management	Is it possible for the company to integrate risk management of food safety and Halal assurance ? (Q14)
	Which parts / processes can integrate risk management of food safety and Halal assurance? (Q15)

TABLE 2
COMPANY PROFILE AND RESPONDENT IDENTITY

Company Profile		
	Case 1	Case 2
Product	Fresh chicken meat	Processed chicken food products, such as nuggets, sausages and meatballs
Number of employees	403	1500
Establishment date of the company	2008	2013
Marketing area	National	National
Food safety certification	-	ISO 22000
Halal certification	MUI	MUI
Respondent Identity		
Gender	Male	Male
Age (years)	30	30
Position	QC inspector	QC inspector
Education level	Bachelor	Bachelor
Period of employment (years)	5	5

III. RESULTS

Case Study

Case 1

The first company was founded in 2008 and has 403 employees. The main products produced are fresh chicken and frozen chicken which are marketed throughout Indonesia, and in particular in Eastern Indonesia. The marketing of fresh chicken is done through retail and fast food restaurants. While frozen chicken is used as a raw material for food seasonings.

Commitment to food safety and Halal assurance is demonstrated through the implementation of HACCP (Hazard Analysis Critical Control Point) and (HAS) (Halal Assurance System) which has been in place since 2014. HACCP is implemented by the company to avoid physical, biological, and chemical contamination of its products. While HAS is followed to ensure the Halal integrity of its products.

Case 2

The second company was established in 2013 and has 1500 employees. It produces processed chicken food products, such as nuggets, sausages, and meatballs. The products are marketed throughout Indonesia through traditional markets, shops, minimarkets and supermarkets.

Testament to the company's commitment to keep food safe and Halal, the company has been certified FSSC (Food Safety Systems Certification) 22000 and (HAS) since 2014. Certification is an important step taken by the company to avoid the risk of contamination of its products.

Stage 1

Food safety risk

To control food safety the two companies identify the critical points in the food supply chain as well as manage physical, chemical and biological contamination risks.

Q1: The food safety system used

Case 1: HACCP system

Case 2: Identifying a critical point.

Q2: The parts / processes that are a source of risk to food safety

Case 1: Three critical points (CCP) have been identified: temperature decrease, product temperature when loading (shipping).

Case 2: In the process of sausage production there are two sources of risk i.e. cooking and detection of foreign bodies.

Q3: The biggest risk to food safety that needs to be the main concern of the company

Case 1: Product temperature, and physical contaminant hazards.

Case 2: The product may endanger consumers due to non-compliance with food safety.

Q4: Control of physical risk

Case 1: The company seeks to maximize the implementation of HACCP and GMP (Good Manufacturing Processes) systems in terms of employees, processes and equipment.

Case 2: Metal detection screening so that any product which is contaminated by metal or a foreign body is separated and special handling done.

Q5: Control of chemical risk

Case 1: Using food grade materials for all supporting materials in the processing area (eg oil, handsoap, primary plastic).

Case 2: Set standard raw materials, with reference to the standards of the United States (FDA) (Food and Drug Authority), by separating the handling of allergenic and non-allergenic materials.

Q6: Control of biological risk

Case 1: Maximize the implementation of the GMP system in the production process area and quality control of raw materials.

Case 2: The cooking process is carefully monitored in order to achieve standard central temperature of the product so as to kill harmful microorganisms and / or harm.

Q7: Food safety control in the transportation and distribution systems

Case 1: Vehicle condition checks include: box condition, scrup condition, bolt and pallet condition, and cooling system condition.

Case 2: Always maintain good hygiene and temperature control in the vehicle or container transporting the product. The temperature that must be maintained during the shipping process is -18°C .

Q8: Steps taken by the company to minimize risk to food safety

Case 1: Maximize the implementation of HACCP system and food safety training for all employees.

Case 2: Routine training once every three months for employees about the importance of GMP, HACCP and Sanitation, as well as Halal assurance.

Halal risk

To control Halal assurance the two companies maintain Halal certification and manage risks at critical points in the food supply chain.

Q9: The Halal certification system used by the company

Case 1: MUI (Majelis Ulama Indonesia).

Case 2: HAS

Q10: The parts / processes that are sources of risk are not halal

Case 1: Live chickens, raw materials, stunning process, slaughter process, raw material supporting process or product.

Case 2: Procurement process of raw materials, production process, storage process and delivery process.

Q11: The biggest risk to Halal assurance that needs to be the main concern of the company

Case 1: Stunning and slaughter.

Case 2: Consumer confidence in Halal product.

Q12: Control of Halal assurance in the transportation and distribution systems

Case 1: *Ensure that the means of transportation used are clean, non-mixed or used for Haram product (Pork or any blood residue).*

Case 2: *By using special vehicles to transport Halal products, which are separate from non-Halal products.*

Q 13: Steps taken by the company to minimize risk to Halal assurance

Case 1: *Implementation of SJH (Sistem Jaminan Halal) (Halal assurance system), Halal slaughterer certification, checking production support materials.*

Case 2: *Always communicate with BPOM (Badan Pengawasan Obat dan Makanan) MUI if there is any change and / addition of supplier, with the purpose of guaranteeing that raw material is Halal.*

Integration of food safety and Halal risk management

Q14: Possibility of integrated risk management of food safety and Halal assurance

Case 1: *Integration can be done because food safety factors are related to Halal factors.*

Case 2: *Integration can be done throughout the whole process because food safety factors are related to Halal factors.*

Q15: The parts / processes which can integrate risk management of food safety and Halal assurance

Case 1: *Slaughter, roses of advanced production, Decrease of product temperature.*

Case 2: *In the processes of preparation, production, storage, and delivery.*

Stage 2

Risk analysis was conducted to identify food safety and Halal assurance Risk Exposure Values. The risk identification scale is based on the value of Risk Impact and Risk Probability indexes.

TABLE 3
RISK EXPOSURE VALUES

	Case 1			Case 2		
	RII	RPI	REV	RII	RPI	REV
Food safety						
Physical risk	4	2	8	2	2	4
Biological risk	4	1	4	2	2	4
Chemical risk	4	2	8	2	2	4
Halal assurance						
Facilities and equipment	3	2	6	1	2	2
Labor	2	3	6	1	3	3
Supplementary food	2	1	2	2	2	4
	4	3	12	3	1	3
Slaughtered animal species	2	1	2	3	1	3
Packaging materials	2	2	4	2	1	2
Storage and warehouse	3	2	6	2	2	4

IV. DISCUSSION

Both companies implement food safety and Halal assurance systems to manage and prevent risks. The critical points identified as a source of risk to food safety are the delivery process (Case 1) and the cooking process (Case 2). The results of risk analysis indicate that for Case 1 the slaughter process has the highest risk to food safety and Halal assurance. Whereas, in Case 2, five out of ten items are a high risk to food safety and Halal assurance. Both companies state that it would be possible to integrate risk management of food safety and Halal assurance in the supply chain.

V. CONCLUSION

It is critical for a company to identify critical points in its supply chain in order to avoid physical, biological and chemical contamination risks to food safety and Halal assurance. In addition, food safety certification and Halal certification are important measures a company can take to manage risk. This is to ensure that the resulting product is safe for human consumption and permissible or lawful for consumption by Muslims. The two companies in this case study indicated it would be possible to integrate risk management of food safety and Halal assurance. This is because food safety factors are related to Halal factors. Further research is needed to develop an integrated food safety and Halal assurance risk management model for the food supply chain using Bayesian, Monte Carlo or other method.

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