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Implementation of Food Safety for Halal Food Smes: A Case Study of Fish Crackers

Sartono[1*], Raden Hernadi[2], Devi Nadia[3]
Universitas Muhammadiyah A.R. Fachruddin[1, 2, 3]
Email: sartonocatania@gmail.com[1*], hernadinf@gmail.com[2], devinadia1244567@gmail.com[3]

ABSTRACT

Food safety is an important aspect in supporting the sustainability and competitiveness of halal food Micro, Small, and Medium Enterprises (MSMEs). The implementation of halal certification policies in Indonesia requires MSMEs to ensure that their production processes comply with food safety standards. However, many small-scale food producers still face challenges in identifying potential hazards and implementing systematic food safety controls. Therefore, this study aims to analyze the implementation of food safety through hazard identification and the determination of critical control points using the Hazard Analysis and Critical Control Point (HACCP) method in fish cracker MSMEs in Tangerang, Indonesia. This research employed a qualitative descriptive approach by applying HACCP principles through observation of the production process, interviews with business owners, and expert questionnaires. The stages of HACCP implementation included product description, process flow verification, hazard analysis, determination of critical control points (CCPs), monitoring systems, corrective actions, and documentation procedures. The results indicate that potential hazards in fish cracker production consist of biological and physical hazards, such as microbial contamination, dust, and environmental pollution. Three main critical control points were identified, namely the boiling, cooling and storage, and drying processes. Preventive measures include boiling at a minimum temperature of 80°C for 20 minutes, storage at −5°C to −10°C, and drying using protective nets. In conclusion, the application of HACCP provides an effective framework for identifying hazards and improving food safety management in halal food MSMEs, thereby supporting product quality, consumer protection, and the sustainability of the halal food industry.

KEYWORDS *Halal; Risk;Critical point.*

INTRODUCTION

The progress of regencies and cities is determined by their ability to create a basis for excellence. Regencies and cities in Indonesia must change their development paradigm from the principle of comparative advantage to the principle of competitive advantage. One of the factors that plays a role in regional progress is the existence of MSMEs, including halal MSMEs (Rohimah, Saputra, & Sucipto, 2025). According to the Tangerang Regency Cooperative and SME Agency, there are currently 59,257 SMEs in Tangerang Regency.

In October 2024, the government began enforcing halal certification requirements, including for food MSMEs. Halal certification is a strategic step that can increase competitiveness and greater marketing access for MSME products (Millati, Luthfiyah, & Muhamad, 2023). MSMEs are the driving force behind the development of the halal industry in Indonesia and contribute significantly to the Indonesian economy (Mumtaz JR, 2021). The motivation for implementing internal halal certification is related to internal company processes, human resources, and available resources, while external motivation is related to external company elements such as government intervention and market pressure (Ab Talib, 2017). The entrepreneur marketing dimension has a positive and significant impact on the halal food sector (Deku, Wang, & Das, 2022). Halal socialization efforts have been carried out in the Tangerang area, covering food vendors and poultry slaughterhouses in markets (Rohimah & Saputra, 2024). Halal socialization is also carried out for early childhood in educational institutions such as PAUD (Rusdiana et al., 2025).

Improvements and quality enhancements are needed in various industries (Fitriana, Saragih, & Larasati, 2020). Food quality control is necessary in food production (Fitriana, Kurniawan, & Siregar, 2020). HACCP ensures food safety by determining critical control points and making preventive efforts (Luiz et al., 2023). HACCP has been implemented in various industries, such as the dairy processing industry (Hasna & Ardiansah, 2023). HACCP is also applied in the processing of meat-based food ingredients, such as meatballs (Putri, Ningrum, Putri, & Chotimah, 2023). The implementation of HACCP, particularly the determination of critical points, can prevent physical, chemical, and biological contamination (Budi & Mahmudiono, 2021).

BPOM explains that food safety can be maintained through the application of five main principles. First, maintain hand, equipment, and environmental hygiene to prevent the transfer of microbes. Second, separate raw and cooked foods to avoid cross-contamination. Third, cook properly at a minimum temperature of 70°C to kill pathogenic microbes, and store food at a safe temperature (<5°C or >60°C). Finally, use safe water and raw materials by ensuring cleanliness and avoiding damaged or contaminated materials.

Efforts to improve food safety include improvements in the supply chain (Soesilo, Valentine, & Sulistyo, 2024). Further efforts in food safety include the implementation of clean production in halal food MSMEs (Rohimah, Valentin, Soerahman, Hernadi, & Sartono, 2025).

In the context of food safety, the Hazard Analysis and Critical Control Point (HACCP) system is one of the widely used methods to identify potential hazards in the production process and determine critical control points that need to be closely monitored. HACCP has been widely applied to various sectors of the food industry such as the dairy industry, processed meat products, and other processed food industries (Hasna & Ardiansah, 2023; Putri et al., 2023; Luiz et al., 2023). This system emphasizes a preventive approach through the identification of biological, chemical, and physical hazards that may occur during the production process, so as to minimize the risk of contamination and improve the quality of food products. The implementation of HACCP is also considered to be able to improve production standards and ensure that the food processing process is carried out systematically and controlled.

However, most research on the implementation of HACCP still focuses on large-scale food industries or companies that already have relatively well-established quality management systems. Research that specifically examines the application of HACCP in halal food MSMEs, particularly in fish-based processed products such as fish crackers, remains relatively limited. In addition, many MSMEs do not have an adequate understanding of hazard identification, critical control point management, and the systematic implementation of food safety procedures. This condition indicates the existence of both a research gap and a practice gap between recommended food safety standards and their actual implementation at the MSME level.

Based on these conditions, research on the implementation of food safety systems in halal food MSMEs is very important to conduct. Fish cracker products are one of the traditional food products widely produced by MSMEs and have high market demand. However, the production process, which involves several stages such as grinding, boiling, cooling, drying, and packaging, has the potential to pose various contamination risks if not properly managed. Therefore, hazard identification and the determination of critical control points in the production process are essential steps to ensure the safety and quality of the products produced.

The novelty of this research lies in the comprehensive application of the HACCP approach to fish cracker MSMEs within the context of the halal food industry in Tangerang Regency. This research not only identifies potential hazards that arise at each stage of the production process but also determines critical control points, critical limits, and monitoring systems that can be practically implemented by MSME actors. Thus, this study provides an empirical contribution to the development of a food safety implementation model that is more applicable to halal food MSMEs with limited resources and production technology.

Based on this background, this study aims to analyze the implementation of food safety through hazard identification and the determination of critical control points using the Hazard Analysis and Critical Control Point (HACCP) method in fish cracker MSMEs in Tangerang. The results of this study are expected to provide both academic and practical benefits. Academically, this research can enrich the literature on the application of food safety systems in the halal food MSME sector. Practically, this research can serve as a reference for MSME actors, local governments, and other stakeholders in improving food safety standards, strengthening the implementation of halal certification, and enhancing the competitiveness of MSME food products in an increasingly competitive market.

RESEARCH METHOD

According to the Codex Alimentarius Commission, the steps involved in the HACCP method are 1) Forming an HACCP Team, 2) Describing the Product, 3) Determining the Purpose of Product Use, 4) Creating a Production Process Flow

Diagram, 5) Conducting Field Verification of the Flow Diagram, 6) Conducting Hazard Analysis, 7) Determining Critical Control Points (CCP - Critical Control Point), 8) Establishing Critical Limits for Each CCP, 9) Establishing a Monitoring System for Each CCP, 10) Establishing Corrective Actions, 11) Establishing Verification Procedures, 12) Establishing a Documentation and Recording System.

RESULT AND DISCUSSION

1. The team consists of fish cracker business owners and a team of halal food experts from Unimar.
2. The description of fish crackers is shown in Table 1 below.

Table 1. Description

Product Name	**Fish Crackers**
Product Form	Dried (ready to fry)
Composition	Fresh fish meat, tapioca flour, water, salt, seasoning:
Main Process	Grinding, mixing, boiling, cooling, cutting, drying, frying, and packaging
Target Consumers	General
Distribution	Car and Consumers come directly to the production area.
Packaging	Transparent primary plastic
Storage	Room temperature display case

3. Determining the Purpose of Product Use

The fish cracker product is intended for general use, both personal and commercial. The product must be fried before consumption.

4. Creating a Production Process Flow Chart

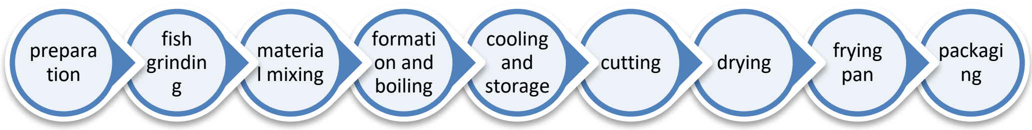

Figure 1. Production Process

5. Conducting Field Verification of Flowcharts

A visit was made to the fish cracker production site, observing the preparation of ingredients, storage of raw materials, storage of finished products, and the drying process. The process of visiting the fish cracker production site is shown in Figures 2 and 3 below.

Figure 2. Observation of finished products

Figure 3. Observation of the drying process

6. Conducting Hazard Analysis

The results of the hazard analysis are shown in Table 2 below:

Table 2. Hazard Analysis

Stages	Type of Hazard	Potential Hazards	Impact	Control Measures	CCP
Preparation of raw materials	Biological	Flies, fish decay	Microbial contamination	Use fresh fish, enclosed space	No
Fish grinding	Physical	Not wearing gloves	Foreign object contamination	Use plastic gloves	No
Boiling	Biological	Insufficient temperature	Microbes do not die	Boil at 80–100°C for 20 minutes	Yes
Cooling & storage	Biological	Flies/rats	Product damage	Store in a sealed freezer	Yes
Drying	Physical	Dust/pollution	Dirty products	Use a cover net	Yes

7. Determining Critical Control Points (CCP)

The results of Critical Control Point (CCP) determination are shown in Table 3 below:

Table 3. Critical Control Points

CCP	Stages	Controlled Hazards
1	Boiling	Live microbes
2	Cooling and storage	Flies/rats
3	Drying	Dust/pollution

8. Establishing Critical Limits for Each CCP
The critical limits are shown in Table 4 below:

Table 4. Determination of Critical Control Points (CCP)

CCP	Stages	Controlled Hazards	Critical Limits
1	Boiling	Live microbes	80°C for 20 minutes
2	Cooling and storage	Flies/rats	-5°C to -10°C
3	Drying	Dust/pollution	Closed mesh

9. Establish a Monitoring System for Each CCP
The monitoring system established for each CCP is shown in Table 5 below:

Table 5. Determination of monitoring systems for each CCP critical limit

CCP	Stages	Controlled Hazards	Critical Limits	Monitoring	Corrective Action	Verification	Notes
1	Boiling	Live microbes	80°C for 20 minutes	Thermometer for each batch	Repeat boiling	Log temperature check	Daily log
2	Cooling and storage	Flies/rats	-5°C to -10°C	Visual & temperature	Put back in the freezer	Weekly audit	Temperature records
3	Drying	Dust/pollution	Closed mesh	Daily visual inspection	Reinstall the net	Supervision	Daily checklist

10. Establishing Corrective Actions
The determination of corrective actions for each CCP is shown in Table 6 below:

Table 6. Determination of Corrective Actions for each CCP critical limit

CCP	Stages	Controlled Hazards	Critical Limits	Monitoring	Corrective Action
1	Boiling	Live microbes	80°C for 20 minutes	Thermometer for each batch	Repeat boiling
2	Cooling and storage	Flies/rats	-5°C to -10°C	Visual & temperature	Put back in the freezer
3	Drying	Dust/pollution	Closed mesh	Daily visual inspection	Reinstall the net

11. Establishing Verification Procedures
The establishment of verification procedures for each CCP is shown in Table 7 below:

Table 7. Determination of Verification Procedures for each CCP critical limit

CCP	Stages	Controlled Hazards	Critical Limits	Monitoring	Corrective Action	Verification
1	Boiling	Live microbes	80°C for 20 minutes	Thermometer for each batch	Repeat boiling	Log temperature check
2	Cooling and storage	Flies/rats	-5°C to -10°C	Visual & temperature	Put back in the freezer	Weekly audit

3	Drying	Dust/pollution	Closed mesh	Daily visual inspection	Reinstall the net	Supervision

12. Establishing Documentation and Record Keeping Systems
The establishment of verification procedures for each CCP is shown in Table 8 below:

Table 8. Determination of Record Keeping Systems for each CCP critical limit

CCP	Stages	Controlled Hazards	Critical Limits	Monitoring	Corrective Action	Verification	Notes
1	Boiling	Live microbes	80°C for 20 minutes	Thermometer for each batch	Repeat boiling	Log temperature check	Daily log
2	Cooling and storage	Flies/rats	-5°C to -10°C	Visual & temperature	Put back in the freezer	Weekly audit	Temperature records
3	Drying	Dust/pollution	Closed mesh	Daily visual inspection	Reinstall the net	Supervision	Daily checklist

The results of this study show that there are two types of contamination risks, namely biological and physical. The first CCP is boiling, with the main hazard being live microbes that can cause food poisoning. The critical limit is a minimum temperature of 80°C for 20 minutes. Monitoring is carried out using a thermometer for each batch. Verification is done by checking the daily temperature log. The second CCP is cooling and storage, with the risk of contamination from flies and rats. The critical limit for storage temperature is between -5°C and -10°C. Monitoring is carried out visually and by measuring the temperature. The third CCP is drying, with the hazards being dust and environmental pollution. The critical limit is that the process must be carried out under a protective net. Monitoring is carried out visually on a daily basis, and corrections are made by reinstalling the net if it is not completely covered.

CONCLUSION

The potential hazards in the fish cracker production process are biological and physical in nature. Physical hazards include dust and environmental pollution. The identified critical control points (CCPs) include the boiling, storage and cooling, and drying stages. Control measures that have been implemented include the use of daily records, storage using freezers, drying using protective nets, boiling at a minimum temperature of 80°C for 20 minutes, and the use of gloves during the production process.

Future research is suggested to expand the scope of the study by involving more types of halal food MSMEs and covering a wider research area in order to obtain a more comprehensive understanding of the implementation of food safety systems in the MSME sector. Comparative studies between regions or between different types of food products are also important to identify differences in the level of HACCP implementation and the factors influencing its success across various MSME contexts. In addition, future studies could integrate food safety approaches with other quality management systems such as Good Manufacturing Practices (GMP), Sanitation

Standard Operating Procedures (SSOP), or ISO 22000 in order to develop a more comprehensive food safety management model for halal food MSMEs. A multidisciplinary approach that combines aspects of food technology, production management, and supply chain management may also provide a deeper understanding of strategies to improve product quality and safety.

Further studies are also recommended to analyze social, economic, and technological factors that influence MSMEs' readiness to implement the HACCP system, such as the level of food safety literacy, government policy support, access to training, and the financial capacity of business actors. Thus, the results of future research are expected not only to contribute to the development of food safety theory in MSMEs but also to generate more effective policy recommendations and implementation strategies to support the strengthening of a sustainable halal food industry.

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