

Mitigation of Halal Risk in the Production Process of Processing Beef Using the FMEA Method in UMKM Dendeng Sapi Asri

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Article Info

Submitted: 20 December 2020
Revised: 5 March 2021
Accepted: 10 July 2021
Published: 30 October 2021

Keywords: Meat, FMEA Method, UMKM Dendeng Sapi Asri

Kata kunci: Daging, Metode FMEA, UMKM Dendeng Sapi Asri

Abstract

Purpose : This research was conducted to identify the risk of being halal that occurs in the production process, calculate the level of halal risk, and provide suggestions for improvements to reduce the risk of the halalness of a production process.

Methodology : This study uses the FMEA method which aims to analyze the risk of events that may occur in the production process and the AHP method is used to determine mitigation priorities that can be applied as a proposed improvement in UMKM Dendeng Sapi Asri.

Results : The results of risk identification found that there were 19 halal risk and five priority risks, namely raw materials that are not registered with LPPOM MUI, mismatches of raw materials received, because animal dung falls from above during drying of meat, the production process has not used work SOPs for each stage of the process. halal, and the shipping process that is potentially contaminated with unclean.

Applications/Originality/Value : At the end of the study, suggestions for improvement were given to reduce the risk of halalness, namely overseeing the implementation of work SOP for employees, and followed by routine cleaning, implementing work SOP, establishing cooperation, checking products before sending, establishing communication, providing training to workers, and positioning drying tools in an appropriate place.

Abstrak

Tujuan: Penelitian ini dilakukan untuk mengidentifikasi risiko kehalalan yang terjadi dalam proses produksi, menghitung tingkat risiko halal, dan memberikan saran perbaikan untuk mengurangi risiko kehalalan dari sebuah proses produksi.

Metodologi : Penelitian ini menggunakan metode FMEA yang bertujuan untuk menganalisis risiko kejadian yang mungkin terjadi dalam proses produksi dan AHP digunakan untuk menentukan prioritas mitigasi yang dapat diterapkan sebagai usulan perbaikan UMKM Dendeng Sapi Asri.

Hasil: Hasil identifikasi risiko ditemukan 19 halal risiko dan lima risiko prioritas yaitu bahan baku yang tidak terdaftar dengan LPPOM MUI, ketidaksesuaian bahan baku yang diterima, karena hewan kotoran jatuh dari atas selama pengeringan daging, proses produksi memiliki tidak menggunakan SOP kerja untuk setiap tahapan proses halal, dan pengirimannya proses yang berpotensi terkontaminasi najis.

Aplikasi/Keaslian/Nilai: Di akhir penelitian, saran untuk perbaikan diberikan untuk mengurangi risiko kehalalan yaitu mengawasi penerapan SOP kerja bagi karyawan, dan diikuti secara rutin pembersihan, pelaksanaan SOP kerja, menjalin kerjasama, pengecekan produk sebelum dikirim, menjalin komunikasi, memberikan pelatihan pekerja, dan menempatkan alat pengering di tempat yang tepat.

1. INTRODUCTION

Competition in the food industry in Indonesia is getting tighter and growing, this requires industry players to be able to maintain or even develop the quality of their respective products. The most important thing that can improve the quality of a food is that it can be seen in terms of its hygiene. Maintaining food hygiene is basically a form of effort to minimize food products from contamination or mixing of dangerous substances so that they can affect the health of consumers who consume them. In addition, there is news about food contamination with bacteria, viruses, parasites, and other harmful chemicals that cause more than 200 diseases, ranging from diarrhea to cancer, greatly affecting the way consumers increase the safety of their food products by global standards (Wahyuni et al, 2019). Thus, it is necessary to pay attention to the processing of a food product in terms of cleanliness, both in the food processing plant and in the food processing process itself.

The Indonesian population is declared to be one of the largest Muslim populations in the world according to the Indonesian Central Statistics Agency (2019), which is approximately 87% of the total population in Indonesia, which is 296.57 million people. With a very large Muslim population in Indonesia, it is certain that they must be able to produce food that is guaranteed to be halal. Increasing awareness of the importance of halal food products for the Muslim community in Indonesia, the demand for halal food will also increase. The Indonesian Ministry of Agriculture states that the level of

meat consumption in Indonesians is 8 kg per capita / year, 30% of which is consuming beef (Maman et al, 2017). Therefore, Indonesia has the potential to increase the growth of the halal-based food industry (Ridwan et al., 2019). Food that is said to be halal is food that is allowed according to Islamic Sharia based on the Al-Quran and Hadith (Marzuki et al, 2014). Foods that are said to be halal are also not only according to Islamic law, but also healthy when consumed (Salman & Siddiqui, 2011). In addition, halal food producers are required to apply the concept of "thoyyiban", which includes quality, nutrition, hygiene, and ethically deliver products to consumers (Ali et al, 2015) (Ali et al, 2014). The importance of halalness itself relates to several things such as legal, clean, quality, nutritious, and healthy (Mahidin et al., 2017)

UMKM dendeng sapi Asri is one of the small and medium units that produces a food product based on processed meat into a finished product, namely beef jerky which is located in the Ampel area, Boyolali. Currently, the UMKM is still in the process of carrying out halal certification from MUI. However, UMKM Dendeng Sapi Asri itself has not identified the risks that can occur in any production process activities, which can cause disruption in the processing of raw materials that will be made into ready-to-sell products that can harm business owners. In order to overcome the various risks that will occur, it is necessary to improve the performance of the production process gradually and be carried out continuously by overcoming and taking precautions for risks that are likely to occur (Ulfah, 2016).

This study aims to identify the risk of halalness in the production process and product processing, by applying the FMEA method to determine the possible risk of halalness in the production process that occurs, and to provide mitigation suggestions in dealing with halal risk using the AHP method. The concept of halal in food processing is not only limited to the ingredients used, but also includes all aspects of the supply chain and food production process including not limited to personal hygiene, clothing, equipment, work areas that are less hygienic and lack of understanding or awareness of workers. in dealing with (Yahya et al, 2016). Thus, it is necessary to separate the meat products from other ingredients which are physically non-halal elements or other hygienic elements (Yaacob et al, 2016).

The halal supply chain is a concept of product flow starting from the raw material actors (suppliers) to the finished product into the hands of consumers, who also pay attention to the halal conditions in the production process (Maman, 2015). The main objective of the supply chain is to create value related to quality, cost, speed and flexibility to the end customer and in the company chain (Chow et al., 2008) To protect the integrity of halal meat production, companies must reduce the problems that cause these products to be halal. or not halal. The integrity of halal meat is one thing that must be protected by all means and must be known by all piha k involved in the production process to mitigate the consequences of risks and their application by all parties so that the resulting product can be said to be a halal product (Mansur et al, 2017). All halal food certification rules and regulations suggest that process and human sources must comply with Islamic principles and pay attention to cleanliness as part of the Islamic religion (Vanany & Maarif, 2018).

Supply chain is a network of companies that come together to create and deliver a product into the hands of the last user (Nugrahanti et al, 2014). Meanwhile, Supply Chain Management (SCM) is a system in which an organization distributes production goods and services to its customers (Indrajit & Djokopranoto, 2002).

Researchers hope that they can provide suggestions for mitigation actions or risk

management that may occur in MSME Dendeng Sapi Asri to improve product quality that can be more attractive to consumers and maximize cleanliness in each process to get halal.

2. METHODOLOGY

In risk identification, this study uses the development of the Supply Chain Operation Reference (SCOR) model, which is a reference to find out the processes that occur in the supply chain in identifying each member involved in the production process (Alfazah et al, 2019) and analyzing the performance of the production process. consists of 5 processes, namely plan, source, make, deliver, and return (Pujawan, 2010). The FMEA method is an evaluation method regarding the possibility of a failure of a system, design, process or service to make handling steps, aims to analyze the risks that will occur in food safety (Andiyanto et al, 2017). While the AHP method is a quantitative technique developed for cases that have various levels (hierarchies) of analysis that can help decision makers make decisions according to predetermined criteria (Herjanto, 2009), which aims to provide a proposal for mitigating the risk of halal production process.

In this study, the researchers obtained data sources from direct observation to MSME Dendeng Sapi Asri either through direct observation or conducting interviews with those concerned. In addition, primary and secondary data are also needed to support research activities. The data used to support this research were obtained from several studies, namely, interviews, literature studies, field observations, and questionnaires. Interviews and questionnaires were carried out directly to the relevant sources, consisting of workers and owners of MSME Dendeng Sapi Asri. The data collected from the results of the questionnaire answers will be processed using the FMEA method to identify the risk of halalness in the production process that occurs through the following steps:

- a. Identifying Failure Mode
- b. Identifying the Effect Of Failure
- c. Identifying Cause Failure
- d. Determination of Value Severity (Severity Level)

- e. Determination of Occurance Value (Likelihood of Occurrence / Frequency)
- f. Identifying Current Control
- g. Determination of Detection Value (Control / Detection Tool)
- h. RPN (Risk Priority Number) calculation

The next step is to use the AHP method to generate mitigation action proposals on the risk of halalness in the UMKM production process of dendeng sapi Asri using the following steps (Marimin, 2008):

- a. Determine the types of criteria that will be requirements
- b. Arrange these criteria in the form of a pairwise comparison matrix

Note:

The method of filling in the elements in the pairwise comparison matrix is:

- 1. $\sum a[j, i]=1$ where $i = 1, 2, 3, \dots, n$
- 2. The upper triangular matrix element as input the intensity of interest
- 3. The lower triangle matrix element has the formula:

$$a[j, i] = \frac{1}{a[i, j]} \text{ for } i \neq j$$

- 4. Sum column matrices
- 5. Calculating the value of \sum column. Criteria with the formula for each column element divided by the number of column matrix
- 6. Calculate the priority value of the criteria by adding the matrix to the results of step 4 and dividing the results by the number of criteria
- 7. Determining alternatives. Which will be options
- 8. Arrange alternatives that have been determined in the form of a matrix of pairs for each criterion,
- 9. Each matrix in pairs, an alternative delivery of n matrices is added per column.
- 10. Calculating the alternative priority value of each matrix in pairs between alternatives with formulas such as step 4 and step 5.
- 11. Test the consistency of each matrix in pairs between alternatives with the formula in step 2 multiplied by the priority value of the criteria. The result of each row is added

and the result is divided by each criterion priority value of $\lambda_1, \lambda_2, \lambda_3, \dots, \lambda_n$

- 12. Calculating λ_{max} with the formula:

$$\lambda_{max} = \frac{\sum \lambda}{n}$$

- 13. Calculating the consistency index (CI) with the formula:

$$CI\lambda = \frac{\lambda_{max} - n}{n - 1}$$

- 14. Calculating the consistency ratio (CR) with the formula:

$$CR = \frac{CI}{RI}$$

- 15. Determine the Random Index (RI) value, based on the number of criteria used.

3. RESULTS AND DISCUSSION

Based on the respondent's data obtained, the value of severity, occurrence and detection in the risk of the production process can be generated in the product at UMKM Dendeng Sapi Asri. The score criteria are assessed with a score range of 1-10 with each criterion according to Rachman et al (2016). An assessment of each mode of failure is obtained through field studies and discussions with related parties. The results of the assessment are shown in Table 1.

From table 1 it can be seen that there are several risks and RPN values. The five risks with a high RPN value are shown below namely:

- 1. Raw materials that are not registered with LPPOM MUI.
- 2. Mismatch of raw materials received.
- 3. Exposed to animal waste that falls from above during the production process (drying meat).
- 4. The production process has not used a work SOP for each stage of the process which is halal.
- 5. The shipping process which is potentially contaminated with unclean.

After knowing the five priority risks, identification of risk mitigation and calculation of risk mitigation weight is carried out using AHP. The results of weighting using AHP can be seen in table 2.

Table 1. Value of Severity, Occurrence, Detection, and RPN Results

Process	Sub Process	Risk	S	O	D	RPN
<i>Plan</i>	Raw Material Procurement Planning	Halal raw materials are not clear	9.375	1	1.625	15.23
		Procurement of raw materials not registered with LPPOM MUI	8.25	1	3.625	29.91
	Production Planning	The production process is not supported in a halal manner	9	1	2	18
		The production process has not used work SOPs for every halal process stage	9	1	3.125	28.13
<i>Source</i>	Raw Material Procurement Process	The equipment and other supporting tools used have not been specifically used for serving halal products	7.875	1	1	7.88
	Acceptance of delivery of raw materials	Mismatch of raw materials received	7.5	4.125	1	30.94
	Checking the raw materials received	The raw material received is contaminated with unclean	10	1	1	10
<i>Make</i>	Implementation of the production process	The use of unclean and less sterile production equipment can lead to uncleanness	9.125	1	1	9.13
		Exposed to animal waste that falls from above during the production process (drying meat)	7.375	6.5	1	47.94
		Use of water that is not sterile	9.25	1	1	9.25
		The use of tools that are corroded and less sterile causes them to become unclean	10	1	1	10
	Production area conditions	Production process errors that could lead to unclean contamination	10	1	1	10
		The condition of the production area which is not clean and sterile allows contamination with animal feces which can cause uncleanness	10	1	1.5	15
		There is no layout and process flow to allow cross-contamination	8.375	1	2.375	19.89
Production quality check	The finished product is unclean	10	1	1	10	
<i>Deliver</i>	Delivery of products to customers	The shipping process is potentially contaminated with unclean	10	1	2.375	23.75
		The means of transportation used are not clean and sterile	10	1	2.25	22.5
<i>Return</i>	Product returns from customers	Products that are damaged and less hygienic and reach expiration time	10	1	1	10
		Products that are exposed to unclean objects when in retailers	10	1	1.875	18.75

Table 2. Mitigation of risks and their weights

No	Risk	Mitigation of risk	weight
1	Raw materials that are not registered with LPPOM MUI	Establish cooperation with raw material suppliers who are clearly halal or registered by LPPOM MUI	14%
2	Mismatch of raw materials received	Routinely contact and check suppliers of raw materials	10%
3	Exposed to animal waste that falls from above during the production process (drying meat)	Positioning the drying device in a room that does not open directly	5%
4	The production process has not used work SOPs for every halal process stage	Provide training or brief knowledge to workers	8%
		Oversee every process that is carried out according to the SOP or not	18%
		Routinely cleaning and checking the equipment used	18%
		Implementing work SOPs at business premises	16%
5	The shipping process is potentially contaminated with unclean	Check the products to be shipped carefully with trusted means of transportation	11%

Based on table 2 of risk mitigation and its weight, it can be seen that the mitigation that has the highest weight is to supervise every process carried out whether it is in accordance with the SOP (Standard Operating Procedure) yet with a weight of 0.18.

The following is an alternative priority sequence based on the highest to lowest weighting results:

- a. Overseeing every process carried out is in accordance with the SOP (Standard Operating Procedure) or not

This first proposed mitigation action aims to improve the sequence of stages in the production process that prioritizes halalness that focuses on cleanliness and avoids existing dirt or impurities, because seen from the company's condition directly there is minimal awareness of cleanliness when producing beef jerky products. Alternative proposals for risk mitigation of halalness in companies in supervising work processes in accordance with SOPs need to be considered so that no errors will occur during production can be done by means of routine business owners supervising every process carried out by workers. So that this proposal is expected to help ensure halal products with the support of work SOPs at each stage of the production process.

- b. Routinely cleaning and checking the equipment used

The second proposed mitigation action aims to ensure hygiene or hygiene for every tool used or to be used, such as meat cutters, meat drying tools, spice containers, spices and meat mixing containers, and many others. Based on direct observations, it is clear that some equipment and environmental conditions in the production are not kept clean. To fix this, the company can routinely clean every equipment and environment that is used before and after the process is running, to avoid existing dirt or unclean things. So, this proposal is expected to help companies to maintain environmental cleanliness and safety of equipment to ensure halal products.

- c. Implementing work SOPs at business premises

This third mitigation proposal aims to improve the structured production process in order to uphold good product quality. Based on the direct conditions at the place of business, there is no SOP or clearly structured order of work. Business owners can provide direction for each work process to workers by giving direct or written notification. So that this mitigation action is expected to be able to help business premises or UMKM Dendeng Sapi Asri to

- have a good work structure by prioritizing halalness and maintaining cleanliness in all aspects.
- d. Collaborating with raw material suppliers who are clearly halal or registered by LPPOM MUI
- The proposed fourth mitigation action is intended so that UMKM dendeng sapi Asri can maximize the halalness of the raw materials used by collaborating with trusted suppliers of halalness by being registered with LPPOM MUI. The results of interviews with business owners stated that it was not clear whether the raw materials used were registered with LPPOM MUI or not. Based on this, business owners can collaborate with suppliers of raw materials that are guaranteed halalness by being registered with LPPOM MUI. Thus, this mitigation action is expected to assist business owners in ensuring the halalness of products based on the raw materials used.
- e. Check the products to be shipped carefully with trusted means of transportation
- The proposed fifth mitigation action aims to maximize the assurance of cleanliness and quality for each product before it is sent to consumers or retailers. It is known from the owner of a company that sends beef jerky products to one of its cities, namely the City of Jakarta and usually sends large quantities of it using large transportation, so the product is very risky of being contaminated with dirt or dust when traveling. So it can be done by providing an additional layer such as extra wrap on each box to avoid the potential for contamination with unclean. So, this mitigation action is expected to guarantee product hygiene up to the hands of consumers.
- f. Routinely contact and check suppliers of raw materials
- The proposed sixth mitigation action has the objective of minimizing the occurrence of errors when receiving raw materials. Based on the current condition of the company, it can be said that it is possible for errors in the raw materials given to occur due to the lack of supervision of the raw materials used. Therefore, communication and routine checks are required with raw material suppliers before the raw materials will be sent to the place of business. So, this mitigation action is expected to help companies to minimize errors in raw materials to be received from supplier.
- g. Provide training or brief knowledge to workers
- The proposed seventh mitigation action aims to support the implementation of a structured work SOP in four businesses. Judging from the current conditions, the company only told us about the stages of the beef jerky making process without the neat structure. To improve this, this can be done by providing training or brief knowledge to workers so that they not only focus on the production process but also prioritize the production process that cares about the halalness of each process, namely by paying attention to environmental conditions to keep it clean, all equipment used is not rust and know how to clean and cut meat properly according to religious regulations. Thus, this mitigation action is expected to assist companies in achieving good product quality with a structured production process with broad knowledge of workers.
- h. Positioning the drying device in a room that does not open directly
- The proposed eighth mitigation action is aimed at minimizing the occurrence of contamination between products and unclean (animal dung) when drying the meat in an open space. Based on the survey results, the place of business drying meat on the roof of the house has direct access to sunlight, so that there is quite a large amount of contamination between the meat being dried and animal dung. To overcome this, it can be done by utilizing a slightly closed area on the roof or an area that is not open as a whole. So, this mitigation action is expected to help to avoid dropping animal waste on meat that is in the process of drying.
- The proposed alternative mitigation options selected above can be applied by way of the business owner providing knowledge or training to each worker on maintaining the cleanliness

of the environment and the equipment used in carrying out work, and the business owner also routinely supervises every process carried out whether it is in accordance with the SOP or not.

4. CONCLUSIONS

Based on the results and discussion above, the following conclusions can be drawn:

1. There are 19 modes of failure of halal risk and five priority risks, namely raw materials that are not registered with LPPOM MUI, mismatches of raw materials received, because animal dung falls from above during drying of meat, the production process has not used work SOPs for each stage of the

process. halal, and the shipping process that is potentially contaminated with unclean.

2. To reduce the existing risk, UMKM dendeng sapi Asri can carry out eight risk mitigation, namely monitoring every process carried out whether it is in accordance with the specified SOP or not, regularly cleaning and checking equipment used during production, implementing work SOPs that uphold halal, establish partnerships with suppliers of raw materials who are clear about their halal status or are registered with LPPOM MUI, and carry out careful inspection of products to be shipped along with reliable means of transportation.

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