

Assessment of Halal Tayibban Risks in Broiler Farming Activities Using the 'Cause-and-Effect Diagram' Approach

¹Mohd Hasli Ramli, ²Arieff Salleh Rosman, ³Adi Md Sikin,
⁴Mohammad Aizat Jamaludin

^{1,2}Faculty of Science Social and Humanities, Universiti Teknologi Malaysia, Skudai Johor, Malaysia, ³Faculty of Applied Sciences, Universiti Teknologi MARA, 40450 Shah Alam Selangor, Malaysia, ⁴International Institute for Halal Research and Training (INHART), International Islamic University Malaysia (IIUM), Malaysia
Email: hasli@graduate.utm.my, aswar@utm.my, mohdaizat@iium.edu.my, adisikin@iium.edu.my

To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v14-i7/21176> DOI:10.6007/IJARBSS/v14 i7/21176

Published Date: 28 July 2024

Abstract

Generally, the supply of halal chicken meat is obtained through the process of slaughtering according to Islamic Shariah law and also by adhering to the procedures and standards developed by the authority JAKIM Malaysia. However, while the Halal Assurance Management System (HAMS) focuses on downstream stages like slaughter and processing, it neglects assessing halal risks in upstream farming activities. Therefore, the main objective of this study is to analyze the halal risk elements involved in chicken farming activities until the slaughter process is carried out. In this study, the Halal Tayyiban Risk assessment (HTR) is developed using the cause-and-effect diagram method, also known as the 'Fishbone diagram', which is considered a new approach in halal management. Thus, a qualitative methodological approach is adopted using document analysis methods such as journals, halal guidelines, and standards related to evaluates halal risks comprehensively. The results showed that there were seven HTR's be identified which were during brooding phase, feed withdrawal, medication withdrawal, bird catching process, bird disposal, logistic activity and slaughterhouse. Furthermore, through the analysis of Cause-and-Effect diagram in this study, every element of halal risk not only outlines the potential halal risks but also elucidates the causal factors, enabling more effective mitigation measures to be taken. This assessment framework aids halal industry players in achieving halal compliance more effectively, with potential application in other farming sectors to supply halal meat products to Malaysia's Muslim community.

Keywords: Halal Assurance Management System, Broiler Chicken, Halal Tayibban Risk, Cause-And-Effect Diagram.

Introduction

Chicken meat has been an important and cheap source of protein as compared to other meat in Malaysia. It also contains vitamins and minerals in addition to the necessary protein for optimal body function (Jamilah, 2015). The local consumption of chicken meat was increased from 103.94% in 2020 to 114.4% in 2021 in (Department of Veterinary Services, 2022). Additionally, projections for the number of chicken livestock in Malaysia also show an annual increase from 284 million heads in 2021 to 294 million in 2022. This increasing trends results in the growth and expansion of the poultry farming sectors at both commercial and small-scale farming operations to meet the supply of poultry products (Shaban & Alabboodi, 2019). Looking at the development of the poultry farming industry to supply fresh chicken meat and chicken-based products to meet consumer needs as a food menu, The poultry farming industry is also the largest contributor to the economy in Malaysia (Jamilah, 2015; Jamilah & Norsuhana, 2011).

In the context of halal chicken meat sourcing, the halal status of food-producing meat is the most crucial element in ensuring that the meat products are free from any risk of haram contamination or non-compliance with Islamic Sharia' law. Furthermore, food safety aspects also play a crucial role in ensuring that the meat produced is safe and free from contamination risks that could affect human health. In this matter, both of these aspects are closely related to the application of the concept of halal tayyiban (HT) in the production of chicken meat products, particularly chicken-based products, to comply with Islamic requirements derived from the Quran and Hadith (Ariffin et al., 2021). In connection with this, this study discusses and analyses in more detail the potential halal risks that may occur during chicken meat maintenance activities and assesses the degree of risk so that elements of non-compliance with halal can be completely prevented. Not only can the determination of halal non-compliance enhance the integrity of halal chicken meat, but it also aligns with the concept of HT, which aims to provide well-being and protect the spiritual and physical health of Muslim and non-Muslim consumers.

Problem Statement

The issue of halal status in chicken slaughter has consistently drawn attention and become a controversy among the Muslim community in Malaysia. Among the issues and questions raised are those related to whether the slaughtering procedures adhere to Sharia' law. Other frequently debated issues include hygiene and sanitation, the potential for chicken mortality due to excessive electric shock, the absence of recognised certification for the slaughterers, and the condition of slaughterhouse infrastructure that may not meet Malaysian halal standards such as MS1500:2019 (Halal food- General requirements- Third revision) (Department of Standards Malaysia, 2019b). For example, the chickens marketed in Manir, Kuala Terengganu were reported to not comply with valid slaughter requirements by a local newspaper which were consequently investigated by the Terengganu Department of Islamic Affairs (Adlan, 2021). In addition, there was a claim on the use of enzymes derived from pigs as accelerators in the growth of poultry as reported in another local newspaper dated September 29, 2007, which led to the demand by the Federation of Malaysian Consumers Associations to interrogate the claim. These enzymes were known to have been used in several countries to increase the water content of meat and hence accelerate the growth of chickens. In these regards, Zain et al (2007), claimed that such issues highlight the need for comprehensive research and examination of the chicken production process, especially in

terms of livestock feeding, to ensure not only the compliance to Islamic law but also food safety.

Animal welfare practices before the slaughter process are considered an important element in handling live chickens. These practices aim to ensure that chickens do not experience stress, which in turn can improve meat quality (Grandin, 2017). Also, Hasli et al (2020a; 2020b), stated that good treatment of animals is part of Islamic requirements and is an important component of the Halal Assurance Management System (HAMS). Addition to that, the halal status of animal food ingredients is important. Although the majority of chicken livestock feed is plant-based, there is a risk of using ingredients with non-halal status to reduce operating costs (Nurulaina et al., 2017). According to Yaacob et al (2016), there are a number of reasons why industry participants in the livestock sector may have little exposure to the implementation of halal compliance and HAMS at the beginning of broiler farming. This is because compliance and halal certification only focus on the upstream chain level, involving processes from slaughter to processing of chicken products. Moreover, halal-related standards also do not emphasis the aspect of halal animal husbandry as a requirement to produce livestock products that adhere to the concept of HT. In relation to that, Omar et al (2012), claimed that the discussions regarding the HT focused on the transfer of livestock from the farm to the slaughterhouse. They also mentioned that certain elements, such as feed sources and medications for livestock as well as animal welfare have not received adequate attention.

HT should be observed expansively from the chicken rearing stage to the chicken meat processing. Rahman et al (2021), and Razaly and Zakaria (2018), emphasised that the implementation of HAMS is essential at the pre-slaughter and during slaughtering process. However, the discussions regarding the implementation of the HAMS at the farm level are somewhat limited. Ashraf and Abd Rahman (2018); Omar et al (2012), claimed that animal welfare which includes feed and medication at the farm level is paramount for the halal integrity of chicken meat production. Furthermore, Shahdan et al (2016), and Shariff and Mohzal (2019), emphasised that elements such as farm location, food safety systems, food sources, vaccination programmes, and logistics are considered critical points for halal compliance. Most recently, Hasli (2022), discussed HT compliance for the hatching and rearing of broiler chickens by determination of its critical halal points.

The Halal Food-General Requirements (MS 1500:2019) states that giving animals on land or in water dirty food sources is not allowed under sections 4.5.1.1.1 (h) and 4.5.1.1.2 (c) (Department of Standards Malaysia, 2019b). These sections emphasize the need for animal feed to comply with the principles of halal and Islamic Sharia'. Additionally, subsection MS ISO 22000:2012 (Food Safety Management Systems - Requirements for any organization in the food chain) (iv) and FSSC 22000 Version 5.1 (Food Safety System Certification 22000) (Department of Standards Malaysia, 2012; FSSC 22000 Foundation, 2020) stress that food safety monitoring begins at the animal farming stage. In this regard, the aspects of food quality and safety assurance are thoroughly examined, especially in the animal feed manufacturing process and the administration of medication to animals, ensuring that the resulting meat products pose no risks to the health of animals and humans. Therefore, the main objective of this study is to analyse the halal risk elements from broiler chicken farming to the slaughter process. Furthermore, this study identified the causes of halal risks via cause-

and-effect diagram framework. This particular approach is new in the assessment for halal compliance, especially in the area of chicken meat processing. This approach enables a comprehensive and holistic assessment of halal risks involving document analysis of secondary sources such as journals, past research articles, guidelines, and manuals related to halal and broiler chicken farming.

Literature Review

Halal Tayyiban Concept

The term 'halal' (حلال) is derived from the arabic word '*halla, yahillu, hillan*,' which conveys the meaning of freeing, releasing, and allowing (Ibn Manzur, 1997). Halal is commonly understood as something permissible, allowed, and not prohibited or forbidden according to Islamic law (Yusuf al-Qaradawi, 2000). In terminology, halal refers to things that are permitted or mandated by Allah SWT (al-Qaradhawi, 2019). The principles of halal aims at preserving the well-being of humans, both physically and spiritually, as emphasised in Islamic teachings and the commandments of Allah SWT to all of humanity in this world (Sharif & Mohd Izhar Ariff, 2017). It is not only related to food but also encompasses a way of life that aligns with the principles of halal in Islam. This aligns with the Quran in Surah Al-Baqarah, verse 168:

يَا أَيُّهَا النَّاسُ كُلُوا مِمَّا فِي الْأَرْضِ حَلَالًا طَيِّبًا وَلَا تَتَّبِعُوا خُطُوَاتِ
الشَّيْطَانِ إِنَّهُ لَكُمْ عَدُوٌّ مُبِينٌ ﴿١٦٨﴾

Means, “O ye people! Eat of what is on earth, Lawful and good; and do not follow the footsteps of the evil one, for he is to you an avowed enemy”.

Based on the Quranic verse above, it is very clear that the element of goodness (*tayyib*) plays a crucial role in the lives of Muslims, especially for selection of food. The term 'tayyiban' refers to the concept of goodness, which describes food that must be pure, nutritious, provide energy, and support a balanced and high-quality diet for humans in the Islamic perspective and neglecting the aspects mentioned in food selection can have negative effects on the health and physical condition of individuals (Tahir & Kashim, 2018). In this regard, Islam has established a number of guidelines to follow when choosing food sources. Among these guidelines is the prohibition of consuming food that does not comply with Islamic law and cleanliness during food preparation and processing that must be carefully maintained. Furthermore, Islam emphasises the dangers of consuming food that can harm health and affect the mental faculties of individuals (Zulkifli, 2019). This matter is explained by Allah s.w.t. in Surah al-Maidah, verse 88:

وَكُلُوا مِمَّا رَزَقَكُمُ اللَّهُ حَلَالًا طَيِّبًا وَاتَّقُوا اللَّهَ الَّذِي أَنْتُمْ بِهِ مُؤْمِنُونَ ﴿٨٨﴾

Means, “Eat of the things which Allah hath provided for you, lawful and good; but fear Allah, in Whom ye believe”.

Obviously, the concept of "tayibban" is still very much relevant in the development of food processing. The introduction of new technologies must be thought about to make sure that the purity of halal and "tayibban" is not compromised. In the spirit of "tayibban", the Department of Islamic Development Malaysia (JAKIM) approved the halal standard of MS1500:2019 to ensure the processing of halal food products in parallel with the HAMS guidelines for the issuance of Malaysian halal certificates (Sani & Dahlan, 2015).

Halal Management System in Malaysia

HAMS firstly was developed by the Department of Islamic Development Malaysia (JAKIM) in 2011. The guidelines in HAMS were reviewed for improvements in 2020. This second review has resulted in new guidelines in the development of the Malaysian Halal Management System (SPHM) and has become an essential requirement, especially for multinational, medium, and small-scale industries (Jakim, 2020a). The Malaysian Halal Certification Procedures Manual (Domestic) Mhcpmd (2020), guidelines, which have been revised four times, have also adopted HAMS to improve the quality and integrity of the products (Jakim, 2020b). To complement with HAMS, a combination of general food safety practice standards such as MS1480 (Food Safety Based on Hazard Analysis and Critical Control Points- HACCP) and MS1514 (Good Manufacturing Practices-GMP for Food) have been used to ensure the assurance and integrity of halal products that comply with the concept of HT (Rahman et al., 2021).

One of the main focuses in the implementation of HAMS is to prevent any potential risks and non-compliance with the halal status during food production Anwar (2018), which lessen the dependence on the quality testing of final products. Therefore, the integration of HAMS into HACCP system should enhance the credibility and integrity of halal products, emphasising both of halal and food safety Lau et al (2016); Raheem and Demirci (2018); Rejaii and Arianfar 2016; Demirci et al (2016), explained that the use of a combined management system between conventional food safety and quality system with HAMS is a relatively new approach to ensure that halal food products not only meet the requirements of sharia' law but are safe for consumers to eat. Furthermore, the implementation of HAMS generally follows the Shafi'i school of thought with reference to sources from the Quran and Hadith. Hence, HAMS is not just an attempt to get halal certification, but to strengthen the halal idea that non-halal substances must not get into the process of making halal products (Ahmad, 2019). Its implementation not only serves as a practical purpose for Halal certification by the authority but more importantly strengthen halal integrity of food product.

Halal Risk Management in Broiler Farm

Risk is defined as issues or situations that have the potential to result in harm or loss (Eksan, 2020). It is a concept that explains the possibility of hazards leading to undesirable outcomes or threats to organisations, assets, the environment, safety, and human health (Department of Occupational Safety and Health, DOSH, 2008). Risk is considered a key factor leading to uncertainty in the occurrence of damage, injury, loss, or negative events due to internal or external weaknesses (World Health Organisation, 1997). It refers to the possibility of unexpected or undesirable events that can lead to loss or uncertainty in achieving specific goals or objectives (Qisthani et al., 2023). In the context of food safety, risk is closely related to the likelihood of hazards or harm depending on the severity level of specific threats to the consumption of possibly contaminated and unsafe food. Therefore, halal risk management

primarily assess and control risks in ensuring that products and services comply with Sharia' principles without any contamination of non-halal elements throughout the supply chain (Sarwa et al., 2021). In this regard, Naqiyuddin et al (2020), stated that food safety elements encompassing physical, chemical, and biological contamination should be considered when assessing potential halal risks. Hence, halal risk management can also be viewed as an essential component of HAMS for identifying, assessing, and managing the risks of non-compliance to halal elements, and thus prevent or reduce the negative impacts that may arise from these risks.

Referring to the broiler supply chain, JAKIM authorities have enforced the development of HAMS as a primary pre-requisite in the application for Malaysian halal certification, particularly for chicken meat production, including slaughter processes compliant with Islamic law and animal welfare practices Hasli et al., (2020a); Hasli et al (2020b), also emphasised the importance of identifying and controlling halal risks related to elements such as food and beverage sources, animal medications, farm biosecurity, farm infrastructure, and logistics facilities, all of which play a crucial role in maintaining the halal integrity of halal chicken slaughter output. This is supported by Khanom et al (2021), who claimed that risks such as diseases, heat stress, cleanliness, and inadequate biosecurity can have a significant impact on broiler farming operations.

Hasli (2022), identified elements of halal non-compliance throughout the broiler farming chain until slaughter. As shown in Figure 1.0, a total of 12 farming activities starting from raising chickens to slaughter was identified. Halal Tayyiban Risk (HTR) were recognized to have a high potential affecting the halal integrity of broiler chicken, which include chick brooding phase in barns, the food withdrawal process, the withdrawal of vaccine and antibiotic materials, the catching process, dead chicken disposal methods, logistics activities, and finally, the process before chicken slaughter is performed. the cause-effect approach using a fishbone diagram was applied to have a more in-depth assessment of the causes for HTR in flowchart shown in Figure 1.0, and further explanations on the assessment were presented in the following section.

Halal Risk Determination and Assessment

The integration of HACCP with HAMS is considered new, especially in the halal food manufacturing and poultry farming industries (Virgianda et al., 2017; Wahyuni et al., 2019). The seven principles are applied in the determination of critical control point or CCP in HACCP system as stipulated in the standard of MS1480:2019 (Department of Standards Malaysia, 2019a). The standard contains a clear set of guided questions to identify every step in a process flowchart exposed to potential contamination before CCP is determined. Similar to HACCP, critical halal point is identified in every step or process involved (Raheem et al., 2018). Fajri (2020), and Kohilavani et al (2015), emphasized that identifying critical points in the process is crucial to identifying halal risks. Additionally, Kohilavani et al (2021); and Shahdan (2017), explained that halal risk control can be identified and assessed using the 'Halal Critical Control Point Decision Tree- HCCPDT' approach similar to that of MS1480:2019. However, it can be considered that assessing halal risks takes a more holistic approach by including the principles of HT based on the Quran, Hadith and fatwa.

Identification of halal risk is important to avoid illicit contamination that could compromise the halal integrity of poultry products. Halal risk and halal risk causing agents are two primary

elements in halal risk identification. Maman et al (2018), explained that halal risk is referred to the elements of a material that do not comply with Shariah laws, such as sources from non-halal animals, improperly slaughtered meat, or meat contaminated by impurities or pathogenic microorganisms. The halal risk causing agents are related to conditions that cause risk to the halal status. However, identification of halal risk alone is insufficient without the measurement of the degree of halal risk to prevent potential halal non-compliance Wahyuni et al (2021a); Wahyuni et al (2018), found that there is a likelihood and possibility of contamination risks on meat products from biological, chemical, and physical agents.

Wahyuni et al (2021b), and Maman et al (2018), developed a risk analysis design method known as 'House of Risk' (HOR). The HOR design serves as a strategy to identify potential halal risks and prioritise the occurrence of risky events. In this way, the likelihood of risk agents causing halal non-compliance can be prevented. However, the HOR approach is found to be different from the HCCPDT method in terms of how risks are analysed. One significant difference is that the HCCPDT method involves a flowchart consisting of a set of questions and answer choices aimed at identifying potential non-compliance or halal risks and appropriate control measures. In this regard, the questions are based on HACCP principles and relevant food safety standards to determine halal risk control points. On the other hand, the HOR method is a model shaped like a conceptual house framework with a roof, walls, and foundation as the main structure. The HOR model is commonly used in food safety risk management to depict the elements involved in understanding and managing food safety risks. Therefore, the HOR method is a dynamic risk management analysis process that requires continuous monitoring and reassessment to ensure halal compliance aspects are assured.

In the current study, the halal risk of each step in broiler chicken farming was based on a process previously reported by Mohd Hasli (2022). Figure 1.0 shows a process flowchart of broiler chicken farming with identified halal tayyiban risk (HTR). The causes of each HTR were discussed via a cause-and-effect (CED) or fishbone diagram in the next section.

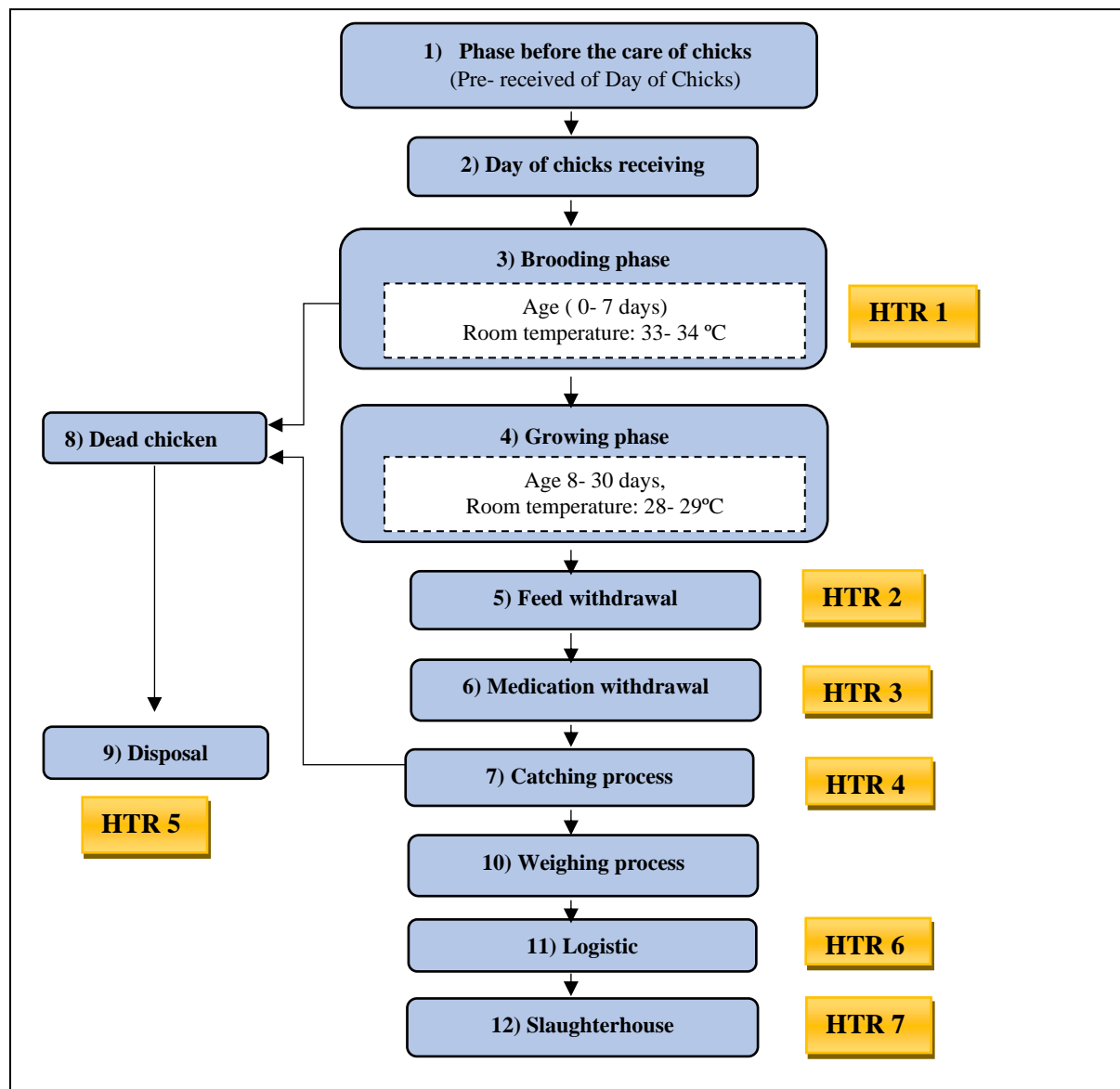


Figure 1 Halal Tayyiban Risk (HTR) on broiler chicken farming activities adapted from the findings of Mohd Hasli (2022)

Cause and Effect Diagram (Fishbone Diagram)

The Cause and Effect Diagram also known as the Ishikawa or Fishbone diagram, is a graphical tool for analyzing root causes of problems, aiding in identifying factors affecting product quality and design (Hill & Jones, 2016). Developed by Dr. Kaoru Ishikawa in the 1960s, initially for engineering quality issues Hayes (2023); Locwin (2018), CED is now applied in pharmaceuticals, food, and beverage industries (Koehler, 2022). It is widely recognized that utilizing the DCE method facilitates the visual identification of problem causes, thereby enhancing organizational comprehension and aiding in the determination of emerging issues (Hill & Jones, 2016). In addition, Locwin (2018), also stressed that, endorsing the benefits of DCE in identifying and analyzing problem-related factors. The DCE application offers several advantages, including its capacity for easy review and comprehension of potential problem risks through qualitative data presentation within its framework. Koehler (2022), suggests that the DCE method is suitable for assessing potential risks in poultry farming activities. This

research will develop a DCE framework to identify and mitigate halal-related risks. The DCE approach not only evaluates halal risk levels but also aids in understanding risk causes through the "what, how, and why" method. The examples of DCE framework can be shown in be illustrated in Figure 2.0 below.

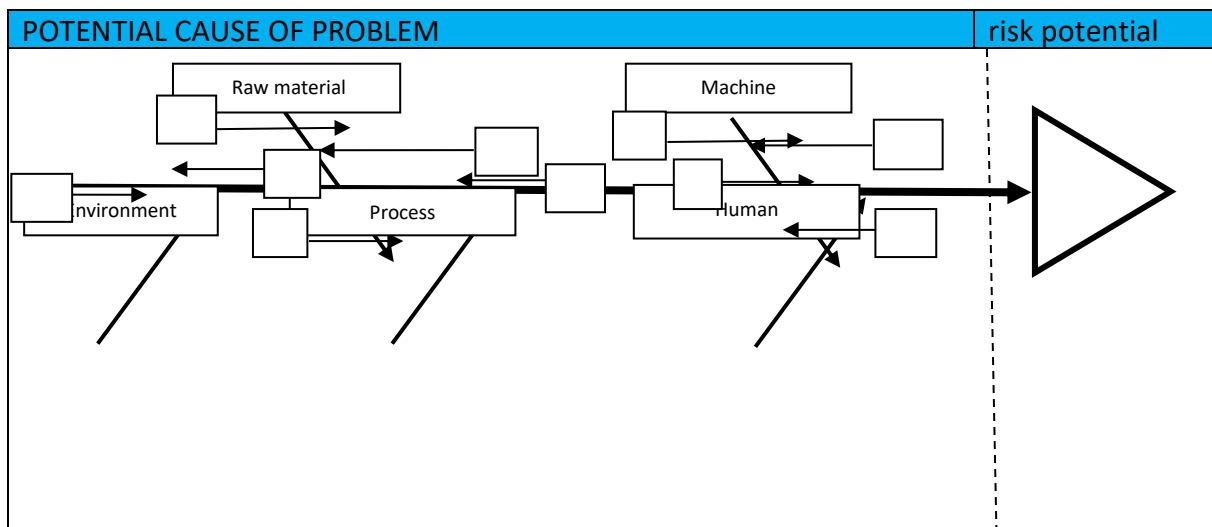


Figure 2.0 Cause and Effect Diagram

Discussion

A discussion on cause and effect of each HT was based on CED as designed by Ishikawa. CED is a graphical framework in the form of a fishbone structure that includes the fish head, representing the effects or existing HT. The fish head shape has a backbone and is connected to fishbone branches, representing the causes of HT. Furthermore, the main branch of the bone has five categories acting as the primary causes of HT, consisting of human factors, machinery, raw materials, processes, and the environment (Varzakas, 2015).

Brooding Phase- Htr 1

The initial phase of chick care on a chicken farm is termed the brooding process. It comprises natural brooding, where the mother hen provides warmth and protection by sheltering chicks under her wings and artificial brooding, which replicates maternal care using heating devices (Giriraj, 2014). Maintaining appropriate temperatures, typically 33–34 degree celcius, is crucial to prevent cold stress and ensure optimal growth and productivity of the chicks. During chick brooding in the coop, various factors can negatively affect halal integrity, including human involvement in disposing of dead chicks. Proper management of chick disposal is advocated by Dafwang et al (2011), to prevent disease spread, with suggestions from Negro-Calduch et al (2013), to bury carcasses for ecosystem benefits. Alternatively, Dafwang et al (2011), propose using closed incinerators to prevent disease transmission by flies. Effective biosecurity measures aligned with company protocols and veterinary regulations are crucial to prevent environmental pollution and maintain halal integrity.

During chick brooding, immunization via vaccination is essential for disease resistance. Vaccines should be administered early, following prescribed dosages at specific intervals (Cobb, 2023; Hankovszky, 2018). Approval from the Department of Veterinary Services (DVS) and supervision by appointed veterinarians are imperative. This ensures both animal health and the safety of consumers seeking halal meat. From a halal perspective, the care of livestock

and animal health is closely related to the practice of animal welfare and adheres to the concept of HT, which aims for the benefit and goodness of humanity. If medication administration to livestock animals does not follow proper procedures and adequate control measures are not taken, it will result in harm, and this clearly indicates that the concept of HT is not fully adhered to.

Feed Withdrawal- Htr 2

The next step is the food withdrawal process. Generally, food withdrawal is carried out before live chickens are captured, once the chicken's weight has reached the specified standards. During this process, broiler chickens are not given any feed for a period of six hours before the capture process takes place. According to the Department of Veterinary Services Malaysia (2006), the food withdrawal period is stipulated to be between four and six hours to prevent microbial contamination during the evisceration process, which occurs after slaughtering. Furthermore, one of the impacts that may occur if chickens are fed before the capture process is the potential for microbial and physical contamination, ultimately leading to food residue in the chicken's crop (Ramli et al., 2023). Therefore, in this context, it is found that this process poses a high risk to the quality of chicken meat after slaughter. Thus, the halal status of the food withdrawal process is considered a significant risk in non-compliance with halal standards, especially in the context of tayyiban.

Medication Withdrawal- Htr 3

The third HTR requirement involves medication withdrawal, ensuring no residues in chicken muscle tissue before slaughter. This discontinuation of vaccines or antibiotics for seven days prevents potential adverse effects on consumers, aligning with halal and tayyiban principles (Department of Veterinary Services Malaysia, 2011a, 2011b). Proper medication withdrawal is vital to uphold halal integrity, similar to food withdrawal, thus this process has the potential to be classified as an HTR.

In addition antibiotics function similarly to vaccines in providing immunity against pathogens, but overuse can lead to adverse effects such as allergies lowered body immunity to bacterial infections, and carcinogen symptoms to humans (Shahdan et al., 2016). The emergence of antibiotic resistance is linked to various risk factors, including human factors, processes, and vaccine ingredients. Safety assessments for vaccines and antibiotics are essential, with adherence to halal principles. The ingredients used in the vaccine should be examined its halal status, especially for broiler used, in order to avoid any haram (forbidden) elements that may affect the halal integrity of chicken meat production. Consequently, aspects of administration and medication withdrawal processes in farming activities pose significant halal risks.

Catching Process- Htr 4

Furthermore, the fourth HTR involves the process of capturing live chickens in the coop before they are sent to the slaughterhouse. In this context, the activity of capturing live chickens in the coop is more focused on animal welfare practices, emphasising gentle handling during the capture of live chickens and ensuring that the logistics process for transporting chickens to the slaughterhouse prioritises compassionate treatment of animals (Hasli et al., 2020a). From an Islamic perspective, Ramli et al (2023), explain that humane treatment of livestock animals is highly emphasised in the Quran and Hadith, where if livestock animals are not treated properly, it can disturb their emotions. In addition, there are three potential risk factors that

may occur. The causative factors are the risk of injury to the legs and wings of chickens during the capture and placing of them in baskets due to handling techniques that do not adhere to animal welfare procedures. The second factor involves the equipment used, which is the chicken basket used for transportation purposes via a transport truck. In this matter, the basket used must be in perfect and clean condition. This is because it can pose a physical injury risk to the chicken's body if the basket used is broken. Finally, the environmental factor is closely related to the ambient temperature during the chicken capture process. If the capturing activity is carried out in high-temperature conditions, it can make broiler chickens uncomfortable and potentially lead to heat stress, which can ultimately affect the quality of the chicken meat produced. It is obvious from the explanations that these risk factors have a close connection to practicing animal compassion in accordance with Islamic teachings.

Chicken Disposal- Htr 5

The next halal risk associated with this element is the aspect of managing the disposal of chicken carcasses. Based on guidelines from the Department of Veterinary Services Malaysia (2019), which state that the disposal of livestock is the last resort to prevent the spread of diseases to other livestock. However, there are other components that are seen to have a significant impact on compliance with the halal concept. Among the components referred to are aspects related to the disposal of chicken carcasses from poultry farming. Calduch et al (2013), state that closed incineration and burial in the soil are effective measures to prevent the spread of infections through pathogenic microorganisms. Improperly managed disposal of chicken carcasses can potentially impact the risk of non-compliance with halal requirements in other food chains. For example, in freshwater fish farming activities. This is because there is a likelihood of farmers selling dead chicken carcasses as food for farmed fish. In this regard, this matter is closely related to the issue of al-Jallalah animals (Jamaludin et al., 2017). However, Jamaludin et al (2017), stressed that al-Jallalah animals can become halal if they are isolated in an area free from non-halal materials and provided with clean feed for a certain period. Selain dari itu, keadaan pelupusan yang tidak sempurna juga boleh mengundang kehadiran serangga lalat yang menjadi vektor utama penyebaran penyakit kepada manusia. According to Hasli et al (2020b); and Ramli et al (2023), it is explicated that the failure to subject chicken carcasses to proper incineration or complete burial in the soil may result in the proliferation of rodents, the occurrence of odor pollution and also there is the high potential for predatory animals such as dogs to enter the farm area. Therefore, in this context, the management of chicken carcass disposal must adhere to the procedures and regulations set by the DVS authorities. Based on the above discussions, the chicken disposal process carried out in broiler chicken farming activities is considered a halal risk point that should be given due attention.

Logistic- Htr 6

HTR also involves risk factors from logistics activities, human elements, and the environment. In the context of halal management, logistics activities play a crucial role in ensuring that transported products, such as raw materials, finished food products, and livestock, are not contaminated with prohibited substances (Shahdan et al., 2016). Omar et al (2012), also emphasised that the transportation process of livestock must adhere to halal procedures and concepts. It highlights the importance that vehicles used for transporting animals to slaughterhouses should not be used for transporting animals that are considered non-halal. Furthermore, these logistic activities also encompass animal welfare practices. In clear terms,

the animal welfare practices carried out before and during logistics activities can result in the supply of healthy and high-quality chicks and poultry.

Moreover, animal welfare practices are in line with Islamic principles that prioritise acts of kindness and ethical treatment of animals when handling livestock according to Islamic laws based on the Quran and Hadith. Farouk et al (2016), who assert that animal welfare practices encompass a variety of aspects, including a scientific approach, ethics, and Islamic dietary practices that emphasize five key aspects of animal freedom such as freedom from hunger and thirst, comfort, freedom from pain and injury, physiological benefit, and, finally, freedom from emotional distress. From the point of view of animal welfare, the room temperature also plays a crucial role during the transportation of chickens into transport vehicles. To minimise the risk of chickens experiencing heat stress, the process of moving chickens into crates and loading them onto trucks should be done in the morning or evening. This is because if the transfer process is carried out at high temperatures, it can cause discomfort to the chickens and even lead to death before the slaughtering process. In conclusion, it can be inferred that logistics activities for transporting live chickens from the farm to the slaughterhouse should be classified as a potential HTR.

Slaughter House- Htr 7

The last potential risk of HTR is the activity before live chickens enter the slaughter phase at the slaughterhouse. At this stage, the risk factors also involve the process, which is the number of chickens placed, not exceeding 12 birds per crate. If the quantity of chickens exceeds the set quantity, it will lead to the potential injury of the chickens. Furthermore, the duration of time the chicken crate is on the truck is also too long, which has the potential to cause stress on the live chickens and, consequently, death before slaughter. Therefore, to reduce the stress faced by live chickens, each time a group of live chickens arrives at the slaughterhouse premises, the live chickens should be placed in a cool and shaded area. In addition to that, the process of spraying water on live chickens is also practiced to reduce body temperature and prevent chickens from experiencing emotional disturbances, ultimately leading to death. This is because if the process of transferring chickens from the truck to the slaughterhouse is done in a weakened state, it does not align with the concept of animal welfare in Islam.

In line with the practice of animal welfare, live chickens should be calmed down before the slaughter process is carried out. According to Ramli et al (2023), states that if chickens are slaughtered under stress, it can affect the quality of the meat and reduce the shelf life of the meat. Based on collective observations, this matter is closely related to the tayibban aspect, involving food safety issues. Therefore, the researchers conclude that the handling of live chickens before the slaughter process is carried out poses a significantly high level of halal risk. Overall, after an explanation of each activity that was found to be a possible HTR and the factors that led to it, the brainstorming results can give researchers a big picture and help them make a DCE framework that they can use to figure out the real causes of problems or risks that happen during the caretaking stage of broiler chicken farming. In summary, the DCE diagram, which covers all the HTR's involved, is illustrated in Figure 3.0 below.

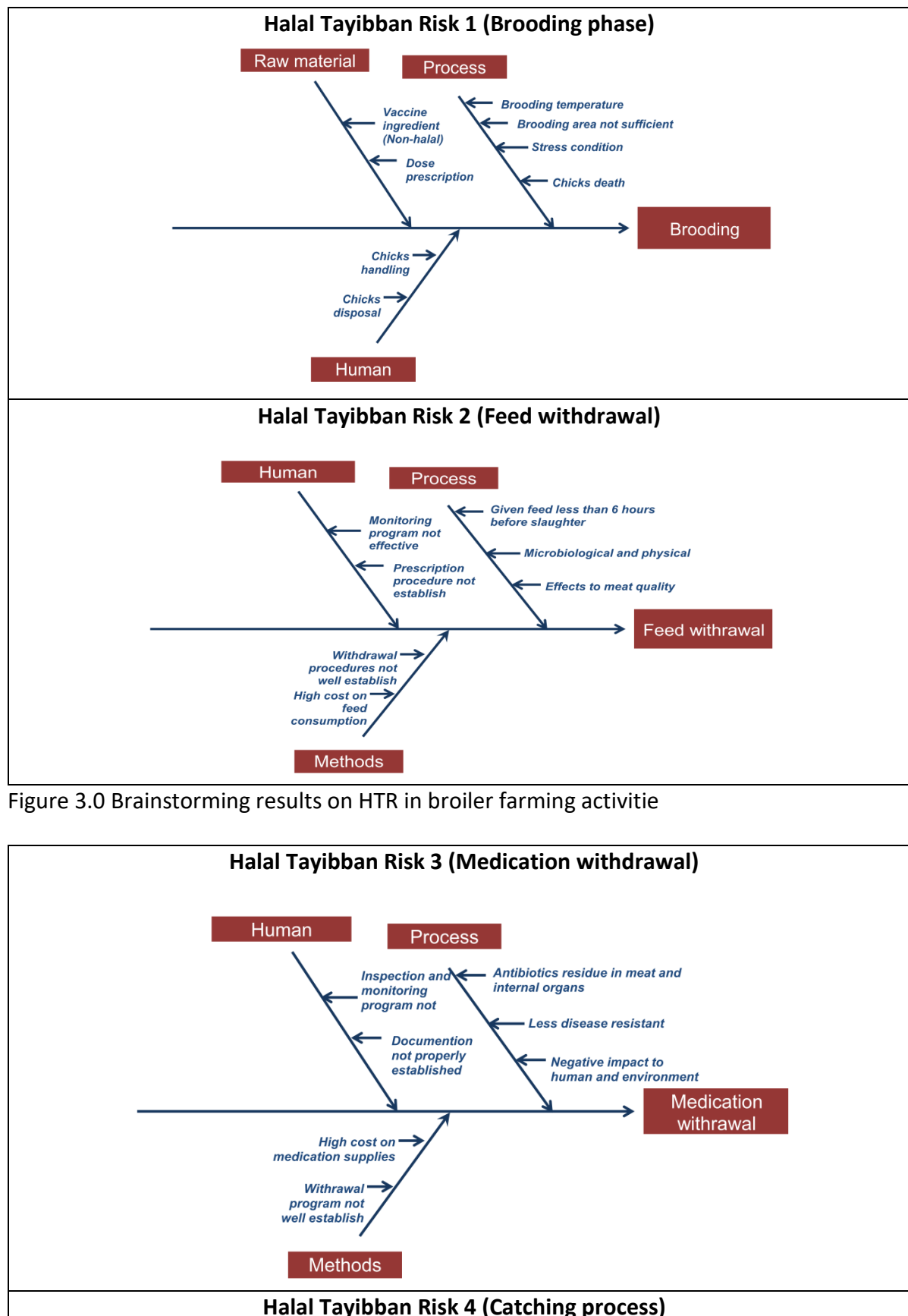


Figure 3.0 Brainstorming results on HTR in broiler farming activitie

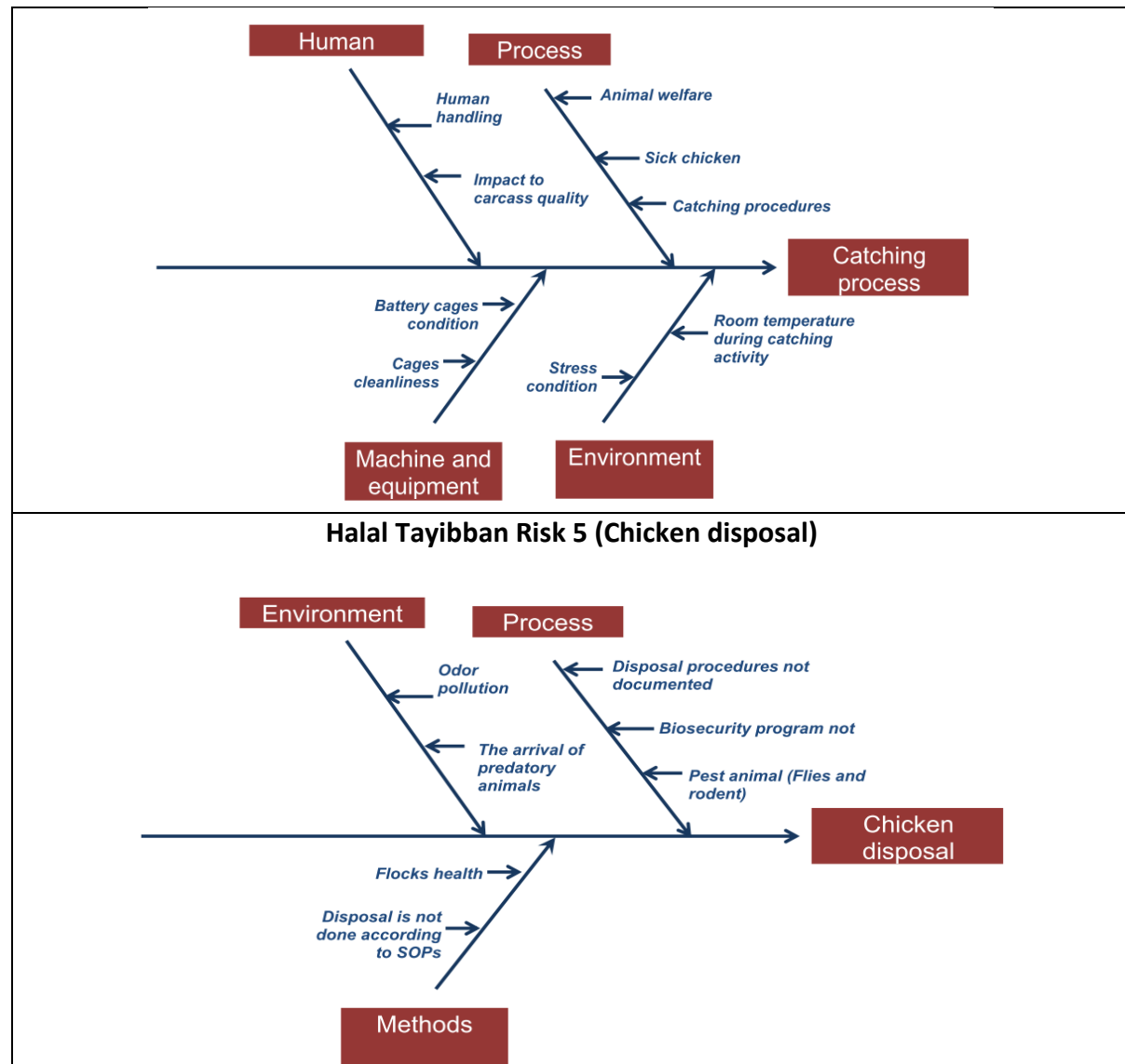


Figure 3.0 Continue.

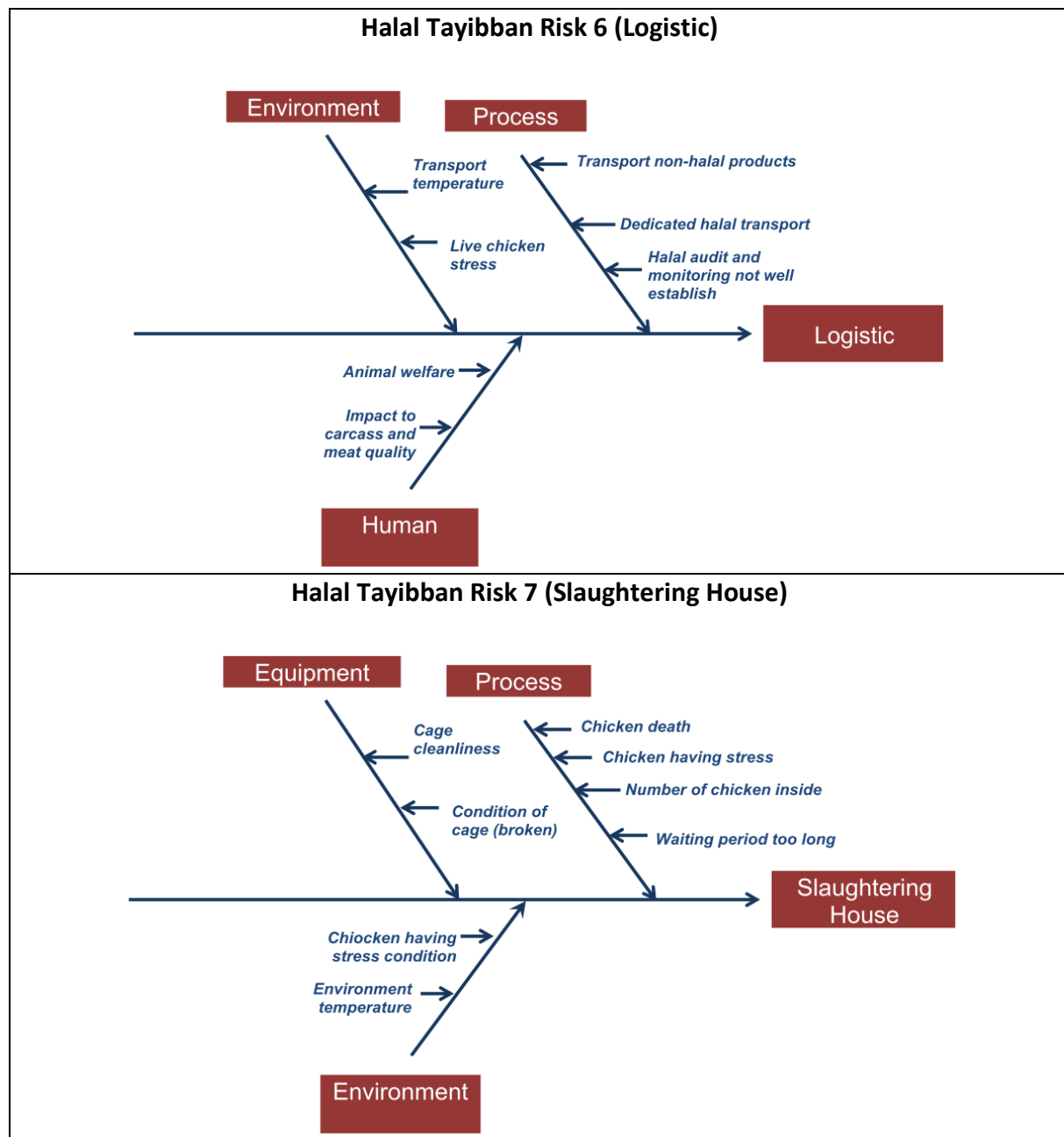


Figure 3.0 Continue

Conclusion and Recommendation

The JAKIM authorities developed the halal management system not only to obtain the Halal Malaysia certification and increase Muslim consumers' confidence in halal products, but it also strengthens the integrity of halal and prevents any potential contamination throughout the involved processes, especially in the production of halal products. Through the HAMS procedures, risk control aspects and halal compliance are carried out to identify activities or processes that adhere to halal standards and Islamic Shariah law. In the context of this study, although the implementation of HAMS focuses only on the halal food manufacturing industry or Islamic consumer goods, its scope is not limited to farming, particularly during the care of farm chickens before they are slaughtered. Consequently, numerous issues arise, especially regarding the status of animal feed, the sources of medication used, and how the animal care process is conducted, leading to controversies among the Muslim community in Malaysia.

Therefore, this study has taken an approach to analyse every halal risk involved in broiler chicken farming activities using the cause-and-effect diagram method. As is known, this cause-and-effect diagram not only lists the elements of halal risk but also identifies the causes of the occurring risks, enabling effective mitigation actions. Subsequently, stakeholders, such as industry players handling halal products, can carry out halal compliance processes more effectively for chicken-based products. Hence, the use of this method, seen as a new approach in halal management, can have a significant impact on ensuring the halal and tayyiban (wholesomeness) status from the beginning to the end of the halal chicken supply chain.

References

- Adlan, M. A. (2021, May 20). JHEAT nafi dakwaan pasar raya jual ayam tidak disembelih. KOSMO online. <https://kosmo.com.my/2021/05/20/jheat-nafi-dakwaan-pasar-raya-jual-ayam-tidak-disembelih/>
- Ahmad, S. J. (2019). Malaysia Halal Management System (MHMS) 2019: What To Expect In The New Halal Assurance Guidelines?. Halal Notes Series-Halal Assurance System, No. 2-2019. https://www.academia.edu/39053347/MALAYSIA_HALAL_MANAGEMENT_SYSTEM_MHMS_2019_WHAT_TO_EXPECT_IN_THE_NEW_HALAL_ASSURANCE_GUIDELINES
- Anwar, M. K. (2018). The urgency of halal assurance system for product reliability. *International Journal of Islamic Business and Economics*, 2(2), 119–125. <http://doi.org/https://doi.org/10.28918/ijibec>.
- Cobb. (2023). Broiler management guide. Cobb-Venteress.com. <http://www.cobb-vantress.com/docs/default-source/management-guides/broiler-management-guide.pdf>
- Dafwang, I. I., Odiba, J. Y. & Ikani, E. I. (2011). Hatchery Management Practices In Poultry. Extension Bulletin No. 86 Poultry Series No. 5. Veterinary Research, (86). <http://www.naerls.gov.ng/extmat/bulletins/Hatchery.pdf>
- Demirci, M, N, Soon, J. M. & Wallace, C. A. (2016). Article positioning food safety in halal assurance positioning food safety in halal assurance. *Food Control*, 70, 257–270. <http://doi.org/http://dx.doi.org/10.1016/j.foodcont.2016.05.059>
- Department of Occupational Safety and Health (DOSH). (2008). Guidelines for Hazard Identification, Risk Assessment and Risk Control (HIRARC). JKKP DP127/789/4-47). <https://www.dosh.gov.my/index.php/legislation/guidelines/hirarc-2/1846-01-guidelines-for-hazard-identification-risk-assessment-and-risk-control-hirarc-2008/file>
- Department of Standards Malaysia. (2012). Food safety management systems- Requirement for any organization in the food chain (MS ISO 22000:2012). Kuala Lumpur: Malaysia.
- Department of Standards Malaysia. (2019a). Food safety according to Hazard Analysis and Critical Control Point (HACCP) system (Second revision) MS 1480: 2019. Kuala Lumpur: Standard Malaysia.
- Department of Standards Malaysia. (2019b). Malaysian standard: MS1500:2019 (Halal food: General requirement – Third revision). Kuala Lumpur: Standard Malaysia.
- Department of Veterinary Services Malaysia. (2006). Panduan penternakan ayam pedaging. Ibu Pejabat Perkhidmatan Veterinary, Putrajaya. <http://www.dvs.gov.my/dvs/resources/auto%20download%20images/56319a6506a8f.pdf>

- Department of Veterinary Services Malaysia. (2011a). Arahan prosedur tetap veterinar Malaysia- Preskripsi Veterinar. Kementerian Pertanian Dan Industri Asas Tani Malaysia. No. Dokumentasi: APTVM 15(b):1/2011. <https://www.dvs.gov.my/dvs/resources/auto%20download%20images/560caeaabefe4.pdf>
- Department of Veterinary Services Malaysia. (2011b). Arahan prosedur tetap veterinar Malaysia- Pemantauan Bahan Biologi Dan Drug Veterinar. Kementerian Pertanian Dan Industri Asas Tani Malaysia. No. Dokumentasi: APTVM 23(d):1/2011. <https://www.dvs.gov.my/dvs/resources/auto%20download%20images/560caeb87b05d.pdf>
- Department of Veterinary Services Malaysia. (2019). Garis panduan pengurusan sisa buangan ternakan ayam. Edisi 1. Jabatan Perkhidmatan Veterinar. Kementerian Pertanian dan Industri Asas Tani.
- Department of Veterinary Services. (2022, October 12). Perangkaan Ternakan. Kementerian Pertanian & Industri Makanan Malaysia. https://www.dvs.gov.my/dvs/resources/user_1/2021/BPSPV/Perangkaan%202020.2021/Final_Combine_Buku_Perangkaan_Ternakan_2020_.pdf
- Eksan, S. (2020). Halal Risk Management: A Systematic Literature Review. *Journal of Management & Muamalah*, 10(2), 2180–1681. <http://jmm.kuis.edu.my/index.php/jurnal/article/view/6>
- Fajri, M. (2020). Sistem Halal-HACCP. *Jurnal Agroindustri Halal*, 6(2), 154–163. <https://doi.org/10.30997/jah.v6i2.3145>
- Farouk, M. M., Pufpaff, K. M., & Amir, M. (2016). Industrial halal meat production and animal welfare: A review. *Meat Science* 120 (2016), 60–70. <http://dx.doi.org/10.1016/j.meatsci.2016.04.023>
- Foundation FSSC 22000. (2020). FSSC 22000 Scheme version 5.1 (November 2020). http://fssc22000.com/wp-content/uploads/2021/02/FSSC-22000-Scheme-Version-5.1_pdf.pdf
- Giriraj, P. (2017). Handbook of poultry practice. Venus Books.
- Grandin, T. (2017). On-farm conditions that compromise animal welfare that can be monitored at the slaughter plant. *Meat Science*, 132(May), 52–58. <https://doi.org/10.1016/j.meatsci.2017.05.004>
- Hayes, A. (2023, January 1). What is an Ishikawa Diagram?. Investopedia. <https://www.investopedia.com/terms/i/ishikawa-diagram.asp#toc-understanding-ishikawa-diagrams>
- Hill, C. W. L., & Jones, G. R. (2016). Strategic Management: An Integrated Approach. Cengage Learning.
- Ibn Manzur., Al-Ansari, J. M. M. A. (1997). Lisan al-Arab, 13 & 15. Mesir: Dar al-Misriyyah li al-Taklif wa al-Tarjamah.
- Jakim. (2020a). Manual sistem pengurusan halal Malaysia 2020. Jabatan Kemajuan Islam Malaysia. https://smarthalal.com.my/MHMS_2020.pdf
- Jakim. (2020b). Manual prosedur pensijilan halal Malaysia (Domestik) 2020. Jabatan Kemajuan Islam Malaysia. https://smarthalal.com.my/MPPHM_Domestik_2020.pdf
- Jamaludin, M., Ramli, M., & Rahman, S. (2017). al-Jallalah: Konsep dan fatwa semasa di Malaysia. *Journal Of Fatwa Management And Research*, 3, 31-44. Retrieved from <http://gids.mohe.gov.my/index.php/infad/article/view/2833>

- Ismail, J. (2015). Kandungan nutrien, asid lemak dan kualiti pemakanan ayam pedaging, ayam kampung, ayam organik dan ayam hutan. [Tesis Sarjana Sains, Universiti Sains Malaysia]. Universiti Sains Malaysia, Pulau Pinang.
- Jamilah, I., & Norsuhana, A. H. (2011). Ayam organik alternatif daging putih kepada pengguna untuk kesihatan yang lebih baik: Satu tinjauan literatur. *Jurnal Sains Kesihatan Malaysia*, 9(2) 2011, 35-43.
- Khanom, H., Hoque, A., Islam, R., Prank, R., Hassan, M., & Alim, M. (2021). An Assessment of Poultry Rearing and Hygienic Management of Broiler Farms of Cox's Bazar District in Bangladesh. *International Conference on Recent Research Development*, 2(2), 1. <https://doi.org/10.53272/ICRRD.V2I2.1>
- Koehler, S. (2022, June 6). What is a Fishbone Diagram?. EMMA International. <https://emmainternational.com/what-is-a-fishbone-diagram/>
- Kohilavani., Abdullah, W. W. N., Yang, T. A., Sifat, S. A., & Zzaman, W. (2021). Development of Safe Halal Food Management System (SHFMS). *Food Control*, 127, 108137. <https://doi.org/10.1016/j.foodcont.2021.108137>
- Kohilavani., Zzaman, W., Abdullah, W. W. N., & Tajul, A. Y. (2015). Embedding Islamic dietary law into an HACCP approach for application to the poultry slaughtering and processing industry. *International Food Research Journal*, 22(6), 2684–2690.
- Lau, A. N., Jamaludin, M. H., & Mei Soon, J. (2016). Quality assurance and halal control points for the food industry. *Nutrition and Food Science*, 46(4), 557–570. <https://doi.org/10.1108/NFS-03-2016-0026>
- Locwin, B. (2018, October 15). When to use a fishbone diagram and why you should do it more often than you think. *Pharmaceutical Online*. <https://www.pharmaceuticalonline.com/doc/when-to-use-a-fishbone-diagram-and-why-you-should-do-it-more-often-than-you-think-0001>
- Maman, U., Mahbubi, A., & Jie, F. (2018). Halal risk mitigation in the Australian–Indonesian red meat supply chain. *Journal of Islamic Marketing*, 9(1), 60–79. <https://doi.org/10.1108/JIMA-12-2015-0095>
- Ariffin, M. F., Rosele, M. I., & Safie, S. (2021). Isu Keselamatan Makanan dalam Sektor Penternakan Haiwan: Analisis Pembangunan Instrumen Berasaskan Hadis. *Islamiyyat*, 43(1), 85–95. <https://doi.org/10.17576/islamiyyat-2021-4301-08>
- Ashraf, M. A., & Abd Rahman, F. (2018). Halalan Tomyiban Poultry Feed: an Appraisal from the Maqasid Shariah Perspective. *International Journal of Engineering & Technology*, 7(3.21), 306–310. <https://doi.org/10.14419/ijet.v7i3.2.17178>
- Ramli, M. H., Rosman, A. S., & @Jima'ain, M. T. A. (2020a). Pengoperasian sistem pengurusan jaminan halal di sektor penternakan ayam pedaging: Satu kajian awal. *Sains Humanika*. 12(3), 67–74. <https://doi.org/10.11113/sh.v12n3.1718>
- Ramli, M. H., Rosman, A. S., Khan, A., Fadzillah, N. A., Hassan, A. M., @ Darawi, A. B. B. S., Saari, Z., Jandra, M., & Jamli, N. A. O. (2020b). Halal assurance management system in chicken broiler industry. *Journal of Critical Reviews*, 7(7), 1046-1051. <http://www.dx.doi.org/10.31838/jcr.07.07.190>
- Ramli, M. H. (2022). Titik Kawalan Kritikal Halal Dalam Sistem Jaminan Halal Di Ladang Penternakan Ayam Pedaging. [Master of Philosophy, Universiti Teknologi Malaysia]. Universiti Teknologi Malaysia, Johor.
- Tahir, M. S., & Kashim, M. M. I. A. (2018). Maqasid shariah in modern foods. *Al-Qanatir: International Journal of Islamic Studies*, 6(1), 10–18. <https://al-qanatir.com/aq/article/view/54>

- Naqiyuddin, A. B., Suzana, J. H., & Matulidi, N. (2020). Halal Risk Management in the Internet Age. *Int. J Sup. Chain. Mgt* (Vol. 9). <http://excelingtech.co.uk/>
- Negro-Calduch, E., Elfadaly, S., Tibbo, M., Ankers, P., & Bailey, E. (2013). Assessment of biosecurity practices of small-scale broiler producers in central Egypt. *Preventive Veterinary Medicine*, 110(2), 253–262. <https://doi.org/10.1016/j.prevetmed.2012.11.014>
- Nurulaina, S., Rahman, F. A., & Abdullah, N. (2017). Animal Feed: Halal Perspective. *International Conference on Humanities, Social Sciences and Education (HSSE'17) London (UK), (March)*, 68–74. <https://www.researchgate.net/publication/316988900>
- Omar, E. N., Jaafar, H. S., & Osman, M. R. (2013). Halalan toyyiban supply chain of the food industry. *Journal of Emerging Economies and Islamic Research*, 1(3), 1–12. <https://pdfs.semanticscholar.org/0ee2/52547f85d7b26e2bea3f8768fcc0b6866498.pdf>
- Qisthani, N. N., Hidayatuloh, S., & Kasanah, Y. U. (2023). Analysis of Beef Halal Critical Points with Halal Logistics Approach and Risk Management. *Journal of Indonesian Tourism and Development Studies*, 22(1). <https://dx.doi.org/10.23917/jiti.v22i1.20617>
- Raheem, S.F., & Demirci M.N. (2018). Assuring tayyib from a food safety perspective in halal food sector: A conceptual framework. *MOJ Food Processing & Technology*, 6(2). <https://doi.org/10.15406/mojfpt.2018.06.00161>
- Rahman, M., Shahril, M., Razimi, A., Nasri, M., & Hussain, M. (2021). Supply Chain Management with Halal Critical Control Points and Impact of Halal Slaughtering in Poultry Industry. *3 Rd International Halal Management Conference (3rd IHMC 2021)*, 114–117.
- Ramli, M. H., Rosman, A. S., @Jima'ain, A. M., Md Sikin, A., & Jamaludin, M. (2023). Halal Critical Point Assessment for Chicken Broiler Upstream Operations. *International Journal Of Business And Technology Management*, 5(4), 107-120. <https://myjms.mohe.gov.my/index.php/ijbtm/article/view/24920>
- Razaly, M. M., & Zakaria, Z. (2018). Pelaksanaan sistem pengurusan jaminan halal di rumah-rumah sembelihan ayam halal dan isu-isu berkaitan: Satu sorotan literatur. *Journal of Shariah Law Research*, 3(1), 105–124. <https://doi.org/10.22452/jslr.vol3no1.5>
- Rejaili, M., & Arianfar, A. (2016). Halal food : A systemic review. *International Journal of PharmTech Research*, 9(7), 340–345.
- Sani, N. A., & Dahlan, H. A. (2015). Current Trend for Food Safety and Halal Measures. *ASEAN Community Conference 2015, Bangi, Malaysia, (November)*, 11–12. <https://www.researchgate.net/publication/291349460>
- Sarwar, A., Zafar, A., & Qadir, A. (2021). Analysis and prioritization of risk factors in the management of Halal supply chain management. *POMS Chronicle*, 1(1), 1-15. <https://dx.doi.org/10.1007/s43621-021-00039-6>
- Shaban, N. S., & Alabbodi, A. S., (2019). Explain why Malaysia broiler industry facing production problem. *International Journal of Applied Research*, 5(1), 301-308. <https://www.researchgate.net/publication/330734921>
- Shahdan, I. A., Regenstein, J. M., & Rahman, M. T. (2017). Critical limits for the control points for halal poultry slaughter. *Poultry Science*, 96(6), 1970–1981. <https://doi.org/10.3382/ps/pew427>
- Shahdan, I. A., Regenstein, J. M., Shahabuddin, A. S. M., & Rahman, M. T. (2016). Developing control points for halal slaughtering of poultry. *Poultry Science*, 95(7), 1680–1692. <https://doi.org/10.3382/ps/pew092>

- Sharif Mohd Tahiri & Mohd Izhar Ariff Mohd Kashim. (2017). Maqasid Shariah In Modern Foods. *Al-Qanatir International Journal Of Islamic Studies*. Vol. 6. No. 1 (2017). <http://myjms.mohe.gov.my/index.php/alqanatir>
- Shariff, S. S. R., & Mohzal, N. A. (2019). Simulating the Track and Trace of Halal Chicken Meat Produce. *Global Journal Al-Thaqafah*, 73, 73–81. <https://doi.org/https://doi.org/10.7187/gjatsi112019-7>
- Varzakas, T. (2015). HACCP and ISO22000: Risk Assessment in Conjunction with Other Food Safety Tools Such as FMEA, Ishikawa Diagrams and Pareto. In *Encyclopedia of Food and Health* (pp. 295–302). <https://doi.org/10.1016/B978-0-12-384947-2.00320-2>
- Virgianda, A. L., Soelih Estoepangesti, A. T., & Hariadi, U. (2017). Implementation of HACCP and Halal Assurance System in Chicken Slaughterhouses in West Kalimantan. In *The 7th International Seminar on Tropical Animal Production* (pp. 927–933). <https://journal.ugm.ac.id/istaproceeding/article/viewFile/30054/18120>
- Wahyuni, D., Nazaruddin., Muharrami, T. A., & Budiman, I. (2021b). Identification of halal risk in risoles production using house of risk method. In *E3S Web of Conferences* (Vol. 332). EDP Sciences. <https://doi.org/10.1051/e3sconf/202133204003>
- Wahyuni, H. C., Putra, B. I., Handayani, P., & Maulidah, W. U. (2021a). Risk Assessment and Mitigation Strategy in The Halal Food Supply Chain in The Covid-19 Pandemic. *Jurnal Ilmiah Teknik Industri*, 20(1), 1–8. <https://doi.org/10.23917/jiti.v20i1.12973>
- Wahyuni, H. C., Vanany, I., & Ciptomulyono, U. (2018). Identifying risk event in Indonesian fresh meat supply chain. In *IOP Conference Series: Materials Science and Engineering* (Vol. 337). Institute of Physics Publishing. <https://doi.org/10.1088/1757-899X/337/1/012031>
- Wahyuni, H. C., Vanany, I., & Ciptomulyono, U. (2019). Food Safety and Halal Food Risks in Indonesian Chicken Meat Products: An Exploratory Study. *IEEE International Conference on Industrial Engineering and Engineering Management*, 1011–1015. <https://doi.org/10.1109/IEEM.2018.8607528>
- World Health Organization (WHO). (1997). Risk Management and Food Safety. *FAO Food and Nutrition Paper*, 65. <https://www.fao.org/3/w4982e/w4982e.pdf>
- Yaacob, T. Z., Jaafar, H. S., Rahman, F. A. (2016). A Review of Regulatory Framework for Halal Meat Supply Chain: The Case of Halal Meat Based Food Products in Malaysia. *Journal of Applied Environmental and Biological Sciences*, 6(9S), 14–21. www.textroad.com
- Yusuf al-Qaradawi. (2000). *Alhalal wa al-haram fi al-Islam* (24th edition). Kaherah: Maktabah Wahbah.
- Yusuf al-Qaradhwai. (2019). Halal Haram Dalam Islam. In Zulkifli Mohammad al-Bakri. (Ed.) (ms. xlix). Pustaka Cahaya Kasturi Sdn Bhd.
- Zain, Z., Hadinata, F., & Mohd Samiran, A. (2007, September 29). Ayam Diberi Enzim Babi: Mudah busuk. *Harian Metro*, <https://azzainmart.com/ayam-diberi-enzim-babi-mudah-busuk/>
- Hankovszky, Z. (2018). *Practical Broiler Management Manual*. http://www.agrofeed.hu/media/catalog/angol/practical_broiler_management_manual.pdf
- Al-Bakri, Z. M. (Ed.). (2019). *Halal Haram Dalam Islam*. Pustaka Cahaya Kasturi Sdn Bhd.