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RESEARCH ARTICLE

BEYOND CERTIFICATION: UNDERSTANDING RISKS IN HALAL ANIMAL FEED SUPPLY CHAINS

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Abstract

Animal feed is a crucial point of control in the production of halal animal-based food. Improper feeding practices repeatedly reported in the media have contributed to the issuance of Fatwas on the impermissibility of animals fed with non-halal feed or impurities in 2007. Hence, feeding animals with Halal feed would be a judicious effort to solve these problems. Nevertheless, in the production and supply chain of halal animal feed, numerous risks must be considered concerning the feed's safety, quality, and halal integrity. The use of non-halal ingredients in animal feed can render the animals non-halal for consumption, as stated by the Malaysia National Fatwa. Additionally, even if the feed is initially halal, it can become non-halal through contamination with non-halal additives, equipment, or utensils. Therefore, a halal risk assessment is necessary to identify and analyze potential contamination risks during feed production. This study focuses on analyzing halal risks in animal feed production in Malaysia, employing qualitative research methodology by utilising a library research approach to identify these risks. In addition, the identification of activities involved in the feed supply chain will also help to analyze the risks. Developing a halal risk analysis and risk ranking matrix is essential for creating a Halal Risk Management Plan for feed production. This framework will benefit feed manufacturers by preventing contamination and assisting Halal authorities in establishing specific standards for halal feed production.

Introduction:-

The issue of feeding haram materials to cultivated fish by some irresponsible farmers has led the National Fatwa Council to declare such fish as haram for Muslim consumption (JAKIM, 2007). This situation has created uncertainty among Muslims regarding the halal status of fish sold in the market. In fact, farm halal animals and aquatic animals which are given non-halal feed or impurities are considered non-halal and cannot be used as raw ingredients in halal food production, according to the MS1500:2019 Halal food – General requirements (Department of Standards Malaysia, 2019). This situation necessitates the use of halal animal feed for animal husbandry practices in the country.

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In 2020, the Manual ProsedurPensijilan Halal Malaysia (MPPHM 2020) excluded animal feed from the list of products that could not be certified halal by JAKIM, marking a significant milestone in the halal industry. This change allows for the certification of animal feed as halal, provided that a related scheme and specific standard are introduced at the national level. Hence, for animal-based food products to be certified as halal, industry players, including food manufacturers, farmers, and breeders, must be aware of the requirements stated in the MS1500 and Manual ProsedurPensijilan Halal Malaysia (MPPHM) 2020 (JAKIM, 2020). Furthermore, the Penang Consumers Association (CAP) has urged the government to revise the Feed Act 2009 to incorporate halal aspects in the preparation, processing, production, and handling of animal feed (Muhammad Yusri Muzamir& Siti Norshafikah Rosli, 2019). This recommendation is reinforced by additional reports emphasizing the need for such amendments (CAP saran pindaanundang-undangpastikanmakananhaiwan halal, 2019; Sajida Asarullah Khan, 2019).

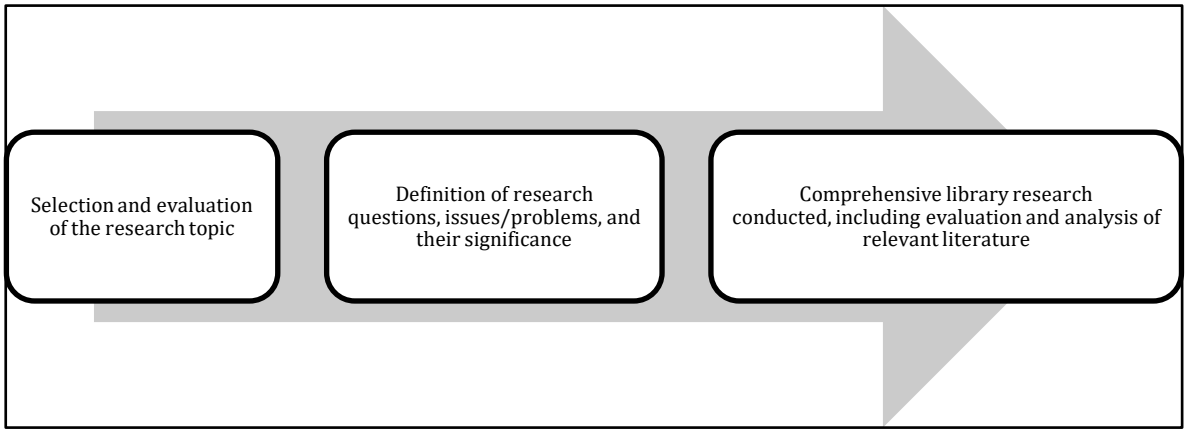
Other concerns include the use of animal by-products, extracts in animal feed, growth hormones, and antibiotics as feed additives, which raise fears of Bovine Spongiform Encephalopathy (BSE) transmission to humans, cancer risks, and antibiotic resistance. These concerns are exacerbated by the lack of a specific standard on halal animal feed production and a general unawareness among farmers and aquaculture industry players about the importance of halal feed in halal food production. As previously reported, nearly fifty per cent of livestock growers in Malaysia are unaware of the necessity of halal ingredients for feed production (Suhaiza Hanim, 2010), and common practices such as using blood meal and pig bone in feed are problematic (Leman et al., 2017)because feeding impurities to halal animals compromises their halal status.

Improving existing animal feed regulations with added Shariah requirements and developing a Halal Risk Management Plan (HRMP) for feed production are essential steps for halal assurance. Besides, many studies have recommended developing a national halal standard for animal feed production, allowing halal livestock growers to choose halal feed (Amalina Mohd Ashraf & Fadilah Abd Rahman, 2018; Emi Normalina Omar, Harlina Suzana Jaafar, & Muhamad Rahimi Osman, 2013; Nurulaina Saidin, Fadilah Abd Rahman, &Noriham Abdullah, 2017). This study aims to identify risks during animal feed production, including common risks during feed supply chain, as initial stepsbefore developing a risk ranking matrix and proposing control measures to ensure the halal and safety status of animal feed. This risk identification is crucial in developing a Halal Risk Management Plan (HRMP) for feed production, which will eventually help maintain the halal integrity of animal-based food products in Malaysia.

Methodology:-

This study adopts a qualitative research methodology, with library research serving as the main data collection technique. This method entails collecting information from diverse sources such as online journal databases, government reports, and newspaper articles relevant to the topic. The research process involved several critical steps: selecting and evaluating the research topic, defining research questions and their significance, and conducting comprehensive library research to evaluate and analyze relevant literature, as illustrated in Figure 1.

Figure 1:- Flowchart of research methodology used in the current study.



Result and Discussion:-

The Halal concept in feed production extends beyond the mere selection of raw materials and ingredients. It encompasses the entire feed supply chain, covering all stages from preparation and manufacturing to storage and distribution. Ensuring compliance with Halal principles at each of these stages is crucial for maintaining the integrity of Halal feed. Hence, identifying contamination risks is essential for ensuring the halal, safety, and quality compliance of halal products. In food production, risk identification enhances halal food preparation and transportation operations and aids in developing preventive approaches. Similarly, in halal animal feed production, risk assessment is crucial to prevent cross-contamination with non-halal elements and eliminate hazards associated with animal feed.

Risk refers to potential damages, injuries, liabilities, losses, or any other adverse occurrences resulting from external or internal factors (Farouk et al., 2016). In the context of supply chain management, risks can be divided into categories such as operational risks, supply and demand risks, product contamination risks, and technology risks. Tummala & Schoenherr (2011) identify operational risk as the most critical factor that elevates the overall risk throughout the supply chain. Operational risk is defined by Tazelaar & Snijders (2013) as the probability of unexpected events or actions that interrupt the smooth operational flow of an organization's daily activities. This type of risk impacts food product distribution by compromising the quality, safety, and halal status of food products (Al-Mazeedi et al., 2013).In order toanalyse halal-associated risks during animal feed production, those involved in animal feed production shall understand all the requirements to ensure halal compliance and identify the potential risks that could compromise the halal status of feed. Among the risks identified include:

Halal Risks Related to the Feed Ingredients

Feed ingredients are crucial in determining the halal status of animal feed. Animal-derived ingredients, in particular, pose a risk as they may come from non-halal animals, especially swine. The use of blood and meat bone meal (MBM), made from slaughterhouse waste and dead animals, is common in feed production, raising concerns about halal contamination. This can affect the halal status of both the feed and the animals consuming it. In addition to animal-derived ingredients, additives such as vitamins, minerals and enzymes as well as preservatives and colorants must also be from halal sources.Besides, the utilisation of non-halal binding agents such as Pro-Bine (Porcine Gelatin Binder) can also jeopardize the halal status of the feed.

According to a study by Suhaiza Hanim Mohd Zailani et al. (2010), 21% of animal feed is derived from animal sources, and 5% is composed of both animal and plant ingredients. Many feed producers lack awareness of halal requirements, mistakenly believing that feed does not require halal certification. Farmers frequently use inexpensive agricultural by-products, animal waste, and by-products such as rice bran, trash fish, and chicken entrails in aquaculture (Roshada Hashim, 2007). These minimally processed feeds can harbor high levels of pathogens, increasing safety risks for the animals (World Organisation for Animal Health, 2010). Additionally, some farms utilize swine by-products in fish feed, rendering the fish non-halal (Nazli Ibrahim, 2013; Sabapatty, 2009; Saifullah Ahmad & Muhamad Adzhar Tajuddin, 2014; Saifullah Ahmad & Nurul Mazwana Hamdan, 2014). The use of genetically modified (GM) crops in feed also raises halal concerns, as 'recombinant DNA' from non-halal sources may be present, potentially affecting the halal status of the crops due to the introduction of non-halal genes.

Risks Associated with Utilization of Animal By-Products, Antibiotics, and Hormones in Animal Feed

The use of non-halal (najs) and hazardous ingredients in animal feed poses a risk to Shariah's objectives of safeguarding religion and human life. As humans consume these animals, contaminants such as animal by-products, antibiotics, and hormones in their diet can pose health risks. In Islam, Maqāsid al-shari'ah aims to protect five fundamental aspects of human life: religion, life, intellect, lineage, and property, ensuring maslahah (public interest) and preventing mafsadah (harm). Islam permits the consumption of halal and safe foods while prohibiting non-halal and unhealthy foods, as supported by Qur'anic verses advocating for halal and wholesome foods (al-A'raf:157; al-Maidah:1, 4, 5, 96) and prohibiting harmful and impure substances (al-Baqarah:173; al-An'am:145). There are explicit prohibitions against feeding animals impure ingredients (JabatanKemajuan Islam Malaysia, 2007; Majelis Ulama Indonesia, 2012; Mohammad Aizat Jamaludin et al., 2011). However, modern livestock production has introduced various challenges concerning feed production and feeding practices, as listed below:

Animal By-Products

The halal and safety considerations of animal feed are significantly compromised by the inclusion of animal by-products, which can be contaminated with non-halal ingredients. Moreover, there is a risk of unintentionally

introducing pork-based components. For example, Meat and Bone Meal (MBM), blood meal, and similar by-products can transmit diseases such as BSE in ruminants and Creutzfeldt-Jakob disease in humans who consume infected meat (Brown et al., 2001; Kusama et al., 2009; Paul et al., 2007). This risk escalates when essential supplements in animal feed are derived from swine or other non-halal animals according to Shariah law.

Unprocessed animal by-products, frequently used in aquaculture (Roshada Hashim, 2007; TitikBudiati et al., 2013), can harbor significant levels of bacteria and mold, increasing the potential for disease transmission to animals and humans (Jędrejek et al., 2016). Incorporating animal by-products into feed jeopardizes the halal status of animals, especially when Meat and Bone Meal (MBM) contains elements from swine or other non-halal sources. Some international MBM products consist of mixed meats and bones from various animals with uncertain halal status (Amir & Mona, 2013). To prevent the transmission of diseases to humans, stringent regulations should govern the use of animal by-products, particularly those from non-halal sources.

Hormone Utilisation

There is growing concern surrounding the use of steroid hormones as growth enhancers in livestock to boost milk production, improve feed efficiency, and accelerate growth rates. This widespread practice raises fears about the accumulation of hormone residues in the milk and meat of treated animals. If not adequately monitored, these residues could potentially increase the risk of cancer in humans due to prolonged exposure to estrogen and steroid hormones (Lawley et al., 2008; Malekinejad&Rezabakhsh, 2015). Scientific evaluations have also underscored potential risks to human health, including developmental, neurobiological, reproductive, and immunological effects, as well as concerns about immunotoxicity, genotoxicity, and carcinogenicity (The Humane Society of the United States, 2016).

Similarly, the introduction of synthetic hormones in animal farming for economic reasons, such as boosting milk production in dairy cattle, is considered problematic due to the potential presence of hormone residues in milk or meat when withdrawal periods are not strictly adhered to. This practice poses potential health hazards to humans, including increased risks of breast, prostate, and endometrial cancers (Malekinejad&Rezabakhsh, 2015).

Utilisation of Antibiotics as Growth Promoters in Feed

The use of antibiotics as growth promoters in Malaysian animal production is concerning. While antibiotics are necessary for treating bacterial infections in agriculture, their misuse can lead to adulteration among feed manufacturers and farmers. Monitoring antibiotic use is crucial to prevent unnecessary usage and ensure food safety.

Although antibiotics are necessary for treating diseases in animal production, their use as growth promoters may contribute to the emergence of antibiotic-resistant bacteria, posing risks to human health and the environment(Dibner & Richards, 2005; Health Action International Asia Pacific (HAIAP), 2013; Regassa et al., n.d.). However, the medicinal use of antibiotics is considered necessary, while their use as growth promoters is discretionary.

The Risks During Feed Production

Feed production involves a few processes including raw material sourcing, receiving and inspection, grinding and mixing, conditioning, pelleting cooling process, screening, packaging and storage and distribution.The schematic flow chart of industrial compound feed pellet production is illustrated in Figure 1:

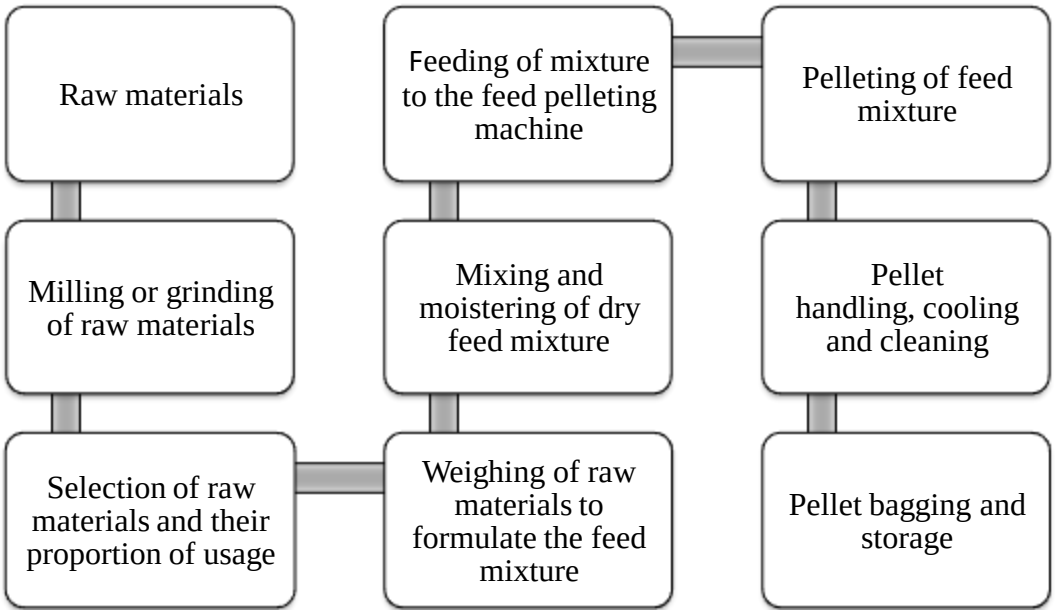


Figure 1:- Schematic flow chart of industrial compound feed pellet production. (Shrinivasa & Mathur, 2021)

The production of animal feed is a critical stage where halal integrity can be compromised. Halal feed, initially made from halal ingredients, may become non-halal during production due to the risk of contamination from additives, equipment, or packaging materials.Hence, the production process must prevent contamination with non-halal substances, including ensuring equipment and facilities are clean and free from contamination with non-halal ingredients or substances.Using the same machinery for halal and non-halal feed production can lead to cross-contamination.

Besides, contamination risk to halal feed products can arise from inadequate monitoring procedures during handling and distribution. Natural hazards, such as biological, physical, and chemical risks, also increase contamination risks for food and feed products (Manning, 2013). A study by Yaacob et al. (2018) indicates that delay risk, natural hazards, and operational risks significantly affect the safety, quality, and halal status of halal food products during transportation. Technology adoption risk and halal integrity risk are also critical factors in risk categorization for halal transportation and distribution processes.

Furthermore, packaging materials can introduce non-halal contaminants, as specified in Clause 4.7 of MS 1500:2019 (Department of Standards Malaysia, 2019). Additionally, hazardous materials used in feed production can compromise both quality and safety, affecting the halal aspect of the products.Even in labeling, materials contaminated with non-halal elements, like ink containing pork fat, pose a risk to the halal status of the feed. Feed manufacturers must therefore ensure the halal integrity of their products from raw materials to finished goods.

An effective risk assessment involves identifying each step in the feed production process, evaluating potential halal risks, and implementing controls associated with the identified risks. Below are the potential Halal Risks for animal feed production and its control measures:

Table 1:- Potential Halal Risks for animal feed production and its control measures.

Step	Potential Halal Risks	Control Measures
Raw Material Sourcing	Non-halal animal by-products	Source only from certified halal suppliers
Production Process	Cross-contamination on shared equipment	Implement dedicated lines or rigorous cleaning protocols
Storage and Distribution	Mixing halal and non-halal products	Clearly label and segregate halal products

Documentation and Certification	Incomplete or inaccurate records	Maintain comprehensive documentation and regularly audit processes

Logistic-associated Risks during Storage and Transportation of Halal Feed

Ensuring the halal status of animal feed extends beyond sourcing and production to encompass every stage of the supply chain, particularly during storage and transportation. Manufacturers face critical risks in maintaining halal integrity, as any mixing of halal feed with non-halal products during these processes can compromise its certification. Proper logistics management is therefore paramount to uphold halal standards, as improper segregation during storage or transport can render certified halal products non-halal. Recognizing this importance, Malaysia has implemented the halal logistics standard MS2400:2010 (Revision MS2400:2019), which mandates rigorous compliance to prevent traceability issues. By adhering to halal logistics practices, the integrity of halal-certified food products is safeguarded throughout their journey in the supply chain (Tarmizi et al., 2014).

Conclusion:-

In conclusion, ensuring the halal integrity of animal feed necessitates a comprehensive approach to mitigate potential risks. This involves rigorous ingredient verification, including thorough checks for halal certification and maintaining an updated list of approved suppliers. To prevent cross-contamination, dedicated production lines should be implemented, and stringent cleaning protocols for shared equipment must be enforced. Besides, supplier management is also very important, with a focus on sourcing from reputable, halal-certified suppliers and conducting regular audits to ensure compliance with halal requirements. Robust quality assurance systems and obtaining halal certification from recognized bodies are essential to maintain continuous compliance. Furthermore, training staff on halal requirements and contamination risks, alongside promoting awareness of halal standards throughout the production process, are vital strategies to uphold the halal status of animal feed.Another viable choice is for the halal authorities to develop specific standards for the production and utilization of halal animal feed at the national level. Implementing these standards would provide livestock breeders with the option to utilize halal-certified animal feed. Opting for halal animal feeds would simplify feed management for Muslim breeders while eliminating uncertainties associated with non-halal substances, particularly those containing traces of swine by-products, during handling and storage. Additionally, using halal feed would add value to animal-based halal food products by preserving the integrity of halal food from the feeding and breeding stages of animal production.

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