

# Vulnerabilities and risk mitigation in Indonesia's halal poultry chain: Bridging compliance and practice

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## ABSTRACT

Halal risk mitigation in certified poultry processing is the focus of this study. The primary objectives are to map the important risk points in the halal poultry supply chain, understand how certification criteria are applied, and evaluate how stakeholder awareness and behaviour affect halal compliance. This research applied a descriptive qualitative approach, leveraging the case study technique through interviews with major stakeholders in the chicken meat supply chain. This research uses source triangulation techniques to validate the data by comparing information from interviews and literature reviews. The findings reveal several critical issues in the halal poultry supply chain, including limited control over halal inputs such as feed and vaccines, and low awareness among farmers regarding halal standards. Inadequate transaction documentation and the unclear halal status of chickens during transfer further compromise compliance. The slaughtering process often does not adhere to shariah requirements, with poor separation between clean and dirty areas, increasing the risk of cross-contamination. Additional concerns include contamination during transportation due to the use of non-designated or unhygienic vehicles, and the absence of halal labelling alongside the use of ingredients from unverified sources.

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## 1. INTRODUCTION

The global halal industry has experienced a remarkable transformation over the past two decades, evolving from a niche religious requirement into a dynamic and strategic segment of the global economy. Driven by increasing global demand for halal products, the market is no longer limited to Muslim consumers but has also attracted attention from non-Muslim populations who associate halal certification with product

safety, hygiene, sustainability, and ethical sourcing. As reported in *The State of the Global Islamic Economy 2018/2019* by Dinar Standard, Muslim consumer expenditure on halal food and lifestyle products reached USD 2.1 trillion in 2017 and was projected to rise to USD 3 trillion by 2023. This surge in demand signifies vast opportunities for Muslim-majority countries to become leaders in halal product innovation, certification, and global trade. However, this opportunity also brings with it significant structural and policy challenges [1].

In Indonesia, despite the enactment of Law No. 33 of 2014 for Halal Product Assurance, which mandates halal certification for food, beverages, and other specified items, implementation is uneven. A significant disparity frequently exists between regulatory frameworks and actual behavior. For example, at certified poultry slaughterhouses (RPA), several managers continue to use slaughterers lacking professional halal slaughter training or valid halal slaughter permits. This technique may result in slaughtering methods that fail to adhere to Islamic standards, so jeopardizing the halal status of the meat. A prevalent problem occurs when the slaughtering capacity of a certified RPA fails to satisfy client demand; in these instances, some RPAs get chicken meat from uncertified slaughterhouses, therefore integrating non-compliant items into the halal supply chain. Furthermore, at the retail level, several vendors deceitfully assert that their poultry is halal-certified by exhibiting unauthorized halal logo to deceive buyers. These instances indicate the disparity between policy and implementation, illustrating how halal integrity may be compromised despite official certification.

Indonesia, home to the world's largest Muslim population, holds a strategic position to lead the global halal industry. Despite this demographic advantage, the country has not been able to fully leverage its potential. Since 2014, Indonesia has consistently ranked within the top ten of the Global Islamic Economy Index (GIEI) but has failed to break into the top five [2]. Several factors contribute to this underperformance, one of the most critical being the country's limited ability to meet comprehensive halal standards across key sectors, particularly the food and beverage industry. While Indonesia's domestic halal food consumption reached USD 169.7 billion in 2017 [2] the country remains a net importer of halal-certified products. This imbalance reflects structural inefficiencies and weak institutional support in the halal production ecosystem.

Among various sectors in the halal supply chain, poultry—particularly halal-certified chicken—plays a foundational role due to its widespread consumption and cultural significance. However, the halal poultry sector in Indonesia faces persistent challenges, including limited awareness among business actors, inconsistencies in halal compliance practices, and insufficient regulatory enforcement. A comprehensive study by KNEKS and the Halal Science Center of IPB [3] revealed that approximately 85% of poultry slaughterhouses in Indonesia operate without halal certification. This poses significant risks to the integrity of the halal supply chain, especially as the country moves toward full mandatory certification.

To address these concerns, the Indonesian government has introduced Government Regulation No. 42 of 2024, which mandates halal certification for all products in circulation, effective from October 2024. The regulation expands beyond end products to include every stage of the supply chain—such as raw material sourcing, slaughtering, handling, transportation, storage, and distribution. While this regulation sets a strong legal framework, its successful implementation requires more than regulatory compliance. Ground-level realities—including gaps in stakeholder understanding, informal practices, and infrastructure limitations—often hinder the consistent application of halal standards.

Field investigations conducted in Yogyakarta offer critical insights into these challenges. Interviews with certified slaughterhouses and halal auditors indicate that informal practices persist even among certified entities. For instance, some businesses share certification documents, rely on verbal assurances rather than verifiable practices, and show minimal consumer engagement regarding halal status—particularly in traditional markets. These practices highlight the deeper behavioral and systemic issues that must be addressed to ensure holistic halal integrity.

These findings are corroborated by recent academic literature. Karudin [4] identify weak distribution systems and poor stakeholder literacy as key contributors to lapses in halal compliance, particularly at points where segregation of halal and non-halal products is necessary. Miranda Sari et al. [5] map more than twenty critical risk points within the halal chicken supply chain—from farm to table—including issues such as improper slaughter techniques, lack of temperature-controlled storage, and unsanitary transportation. Masudin et al. [6] show that while integrated halal supply chain systems can enhance compliance, product quality, and customer trust, they often lack widespread adoption due to limited training, monitoring, and behavioral reinforcement among stakeholders.

Most of these studies emphasize the technical or operational dimensions of halal assurance but tend to understate the human and behavioral aspects [7]. In practice, halal compliance is not merely a matter of infrastructure or documentation—it requires a strong alignment of values, knowledge, and motivation among all actors in the supply chain. This includes producers, processors, distributors, retailers, and consumers. Therefore, addressing the human dimension of halal assurance is essential for improving system-wide effectiveness [8].

In this context, the concept of *halalan thayyiban* becomes highly relevant. The term, derived from Islamic jurisprudence, refers not only to what is permitted (halal) but also to what is wholesome, clean, safe, and ethically acceptable (*thayyib*) [9]. In operational terms, *halalan thayyiban* integrates food safety, hygiene, animal welfare, and environmental ethics into the halal framework. It encourages not just minimal compliance with religious requirements but a commitment to excellence in food production and distribution [10].

Most prior analyses give only cursory attention to the people who make—or break—halal integrity. Yet field evidence shows that even the best-designed SOPs collapse when frontline actors lack shared values, skills, or incentives [11]. Recent capability-mapping studies identify four interlocking competencies that every node in the halal chain must cultivate: religious literacy, risk-based quality control, cross-functional communication, and ethical leadership. Organizations that invest in structured training, mentorship, and peer learning around these competencies report sharper audit scores and fewer non-conformities, underscoring that behavioural alignment is not a “soft” add-on but a technical prerequisite for supply-chain resilience [12].

Equally important is understanding why individuals comply. Behavioural frameworks such as the Theory of Planned Behaviour emphasize that halal practices are more likely to be followed when three factors converge: perceived behavioural control (e.g., access to certified inputs), subjective norms (e.g., religious or peer expectations), and personal attitudes (e.g., moral or spiritual beliefs). In practice, a logistics worker who feels empowered, socially supported, and morally committed is more likely to uphold halal logistics standards, such as cold-chain integrity and segregation [13].

Against this backdrop, the concept of *halalan thayyiban* provides a holistic lens that unites technical rigor with ethical purpose. Beyond legality, *halalan thayyiban* demands food that is safe, clean, ethical, and environmentally responsible. Operationalization of this principle requires the integration of animal welfare protocols, hygienic processing, eco-friendly packaging, and transparent sourcing into every phase of the supply chain. Leading firms have begun adapting their audit tools to cover animal transport stress levels, environmentally sustainable practices, and social impact measures—demonstrating a shift from fragmented compliance to integrated ethical governance [14].

In summary, strengthening halal assurance today demands a dual commitment to robust systems and the human values that bring them to life. The ethos of *halalan thayyiban* offers a culturally grounded yet operationally actionable approach to aligning compliance with collective responsibility [15].

To operationalize this concept, Indonesia can refer to the National Food Safety Control System (NFSC)—a risk-based, integrated system that harmonizes food safety regulations with Islamic dietary laws. The NFSC emphasizes the application of preventive controls at every node of the supply chain and supports a multi-stakeholder approach involving regulatory bodies, certification agencies, private industry, and consumers. NFSC-aligned systems are particularly crucial in managing complex supply chains like poultry, which involve multiple actors, diverse locations, and high-risk points for contamination or non-compliance [16].

This study aims to explore the implementation of halal risk mitigation strategies within the certified poultry processing sector in Yogyakarta. The primary objectives are: (1) to map out the critical risk points in the halal poultry supply chain; (2) to understand how certification standards are applied in practice; and (3) to examine the role of stakeholder awareness and behavior in shaping halal compliance outcomes. By integrating insights from fieldwork, behavioral theory, and risk management frameworks, this research seeks to contribute to the body of knowledge on halal supply chain governance in Indonesia. The findings are expected to inform policy recommendations and best practices that support the development of a resilient, integrated, and credible halal ecosystem—one that aligns not only with national regulations but also with global expectations for safe, ethical, and high-quality food products [17].

## 2. MATERIALS AND METHODS

This research applied a descriptive qualitative approach using the case study method. The purpose of this approach is to explore in depth the risk mitigation practices in the halal chicken meat supply chain,

particularly through the perspectives of stakeholders in the field and halal certification authorities. The case study method enables researchers to gain a comprehensive understanding of the context and dynamics that occur in practice, thereby capturing the complexity of the situation holistically. The concept of *thayyib*, which denotes wholesomeness, safety, and overall quality beyond mere halal compliance, is integral to ensuring that the chicken meat not only meets religious dietary laws but also adheres to ethical, health, and environmental standards. Through the investigation of a halal-certified poultry processing company and its interactions with upstream suppliers and downstream distributors, the study identifies critical risk points, such as cross-contamination during transportation and non-compliance with halal slaughtering procedures, and examines how these risks are addressed through coordinated efforts among producers, logistics providers, and halal certification authorities.

Figure 1 illustrates a schematic depiction of the broiler supply chain network at Yogyakarta. The graphic offers a detailed representation of the distribution flow of broiler chickens from upstream production to final customers. The process commences with plasma farmers, often small-scale poultry producers engaged in a partnership arrangement with a core firm, referred to as a Limited Liability firm (PT) in Indonesia. In this partnership arrangement, the primary enterprise provides vital inputs, including feed, veterinary services, and technical support, to guarantee that broiler chicks are reared in compliance with set quality standards. The symbiotic partnership between plasma farmers and the core enterprise is strategically vital for sustaining production efficiency and guaranteeing constant product quality in the broiler supply chain.

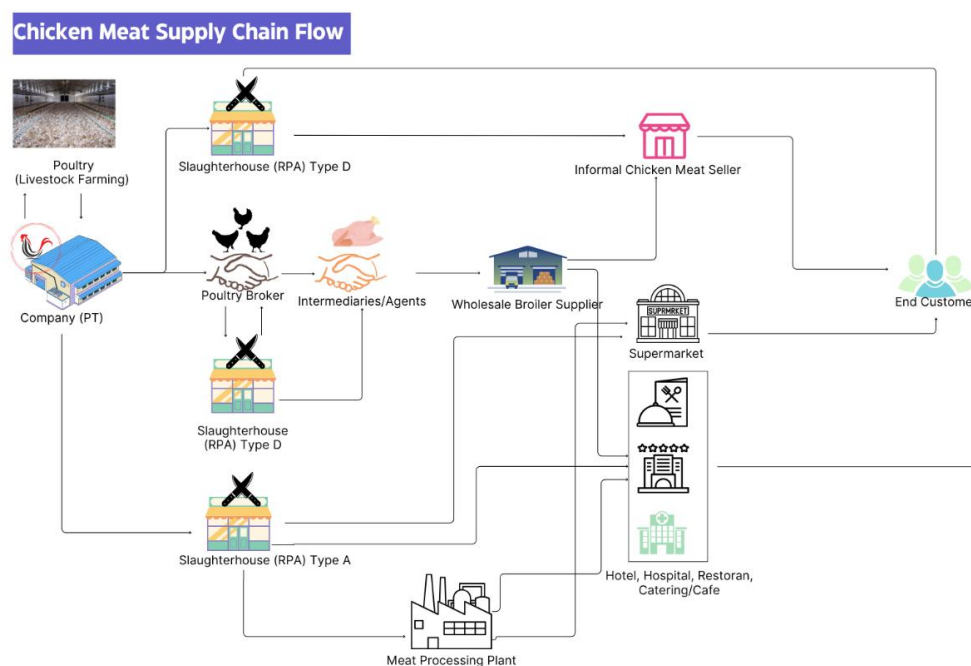


Figure 1 Chicken Meat Supply Chain Flow in Yogyakarta

The hens are ready for sale when they acquire the ideal weight and size. Poultry brokers have become a crucial part in enabling transactions between the firm (PT) and others involved in the supply chain's subsequent phase. In order to ensure that the chickens get delivered to places where they are most needed and sold at a fair price, brokers act as vital middlemen, bringing the business and potential customers together. The hens are taken to the poultry abattoir after the transaction, where they undergo slaughter as required.

Poultry slaughterhouses (RPA) are divided into two categories in this study: Type D (conventional) and Type A. Traditional sub-district slaughterhouses are referred to as Type D RPAs, and the meat and byproducts produced there are only allowed to be consumed locally. On the other hand, Type A RPAs satisfy high specifications, such as having the infrastructure (like chilling rooms) and the ability to butcher over 25 heads of big animals (like cattle) per day. Type A RPA items are permitted for distribution and consumption across district or regency lines. Along with these characteristics, Type A RPAs need to have an internal laboratory and trained staff who can attest that the meat is free of dangerous contaminants such as hormones, antibiotics,

heavy metals, pesticides, and radioactive materials. They must also run fleets of vehicles that deliver frozen or refrigerated meat. As a result, Type A RPA meat products can be exported and distributed internationally [17]. The quality of the chicken meat produced is directly impacted by the RPAs' categorisation into these two categories; this will be covered in more detail in the results section.

The chicken meat enters the distribution stage following slaughter and processing. At this point, the distribution process is separately managed by Type A RPAs and certain Type D RPAs. But for a lot of other Type D RPAs, agents or intermediaries manage the distribution of their processed goods. These representatives are in charge of making sure chicken meat go to end users, food service providers, wholesalers, and retailers. Because they act as a link between production and ultimate consumption, agents play a crucial role in preserving the flow of goods across the supply chain. Broiler chicken merchants (Wholesale broiler supplier), who specialise in buying huge quantities of broiler chickens from agents and reselling them to different end customers, are the next important players in the supply chain [18]. Because they distribute the chickens to a variety of establishments, such as small eateries and other food service enterprises, these merchants have a big say on how many broiler chickens are available in the market.

Small restaurants, as one of the main end-users in this chain, purchase chicken from traders and prepare it for their customers, thus contributing to the local food economy. Type A RPAs allow chicken meat to undergo further processing, such as meat grinding, to create specific products such as chicken patty or chicken-based sausages. This additional processing allows the meat to be used in a wider range of culinary applications, catering to diverse consumer preferences. Ultimately, the supply chain culminates with consumers, who purchase chicken directly from retail outlets or enjoy it as a dish prepared by restaurants.

Small restaurants, as primary end-users in this supply chain, procure chicken from suppliers and cook it for patrons, therefore enhancing the local food economy. Type A RPAs permit the additional processing of chicken meat, including grinding, to produce specified goods such as chicken patties or chicken-based sausages. This further processing enables the meat to be utilised in a wider variety of culinary applications, willing to compromise varied consumer tastes. The supply chain ultimately concludes with consumers, who get chicken straight from retail establishments or savour it as a meal prepared by restaurants.

The whole process reveals the intricate and multifaceted characteristics of the broiler supply chain. Every phase, from farm to ultimate consumption, entails several stakeholders that must collaborate efficiently to guarantee the transparent progression of the product. The intricacy of the supply chain highlights the significance for each participant, from the smallholder farmer who commences the process, to the merchants and agents who enable distribution, and ultimately the consumer who completes the chain by acquiring and consuming the product. This comprehensive flowchart is an essential instrument for understanding the diverse dynamics within the broiler business, highlighting the necessity for efficiency, quality assurance, and effective communication across the supply chain. This comprehensive flowchart is an essential instrument for understanding the diverse dynamics within the broiler industry, highlighting the necessity for efficiency, quality control, and effective communication at every stage of the supply chain to ensure the halal status of chicken throughout the entire network.

This research examines the flow originating from RPA type D. This is due to type A abattoirs using cold chain systems and enhanced hygiene requirements by segregating contaminated regions from clean zones to decrease the danger of faecal contamination (offal). These abattoirs function in accordance with stringent industry standards, frequently include adherence to halal specifications to satisfy the needs of certain consumer markets.

The research was conducted through interviews with two main informants who represent two important perspectives in the halal supply chain:

1. An expert is a halal auditor at LPPOM MUI for around 5 years, who is currently one of the administrators of the UGM Halal Center (R1). The interviewee has extensive expertise in halal certification, slaughterhouse operations, and halal logistics. These specialists offer valuable insights into the precise procedures required to uphold halal integrity across the chicken meat supply chain.
2. Chicken slaughterhouses that have obtained halal certification for around 5 years as the main actors in the halal chicken meat supply chain (R2). Chicken slaughterhouses that have obtained halal certification are the main actors in the halal chicken meat supply chain. They carry out operational processes in accordance with halal principles. RPA managers were selected as informants representing the industry's perspective on implementing halal risk mitigation in the supply chain.

The selection of informants was carried out purposively, by considering knowledge, experience, and direct involvement in the certification process and the implementation of halal principles in the field. Data Collection was conducted through 3 main methods:

1. In-depth interviews were semi-structured approach to enable in-depth exploration of issues related to risk mitigation in the halal supply chain. Primary data were collected through semi-structured interviews conducted in person. Each interview was guided by a set of open-ended questions tailored to the respondent's role. For the halal auditor (R1), the interview covered topics such as the certification process, common causes of failure in obtaining certification, monitoring of post-certification compliance, and identification of high-risk points where halal status could be compromised. For the RPA representative (R2), the discussion focused on operational practices implemented to ensure the halal status of poultry products and the specific challenges encountered in maintaining compliance throughout the processing stages.
2. The literature study was conducted by reviewing various scientific literature, government regulations, as well as national and international halal standards publications from reputable journals. The purpose of this study is to strengthen the results of interviews and observations with the theoretical basis and compare field practices with applicable regulations (data triangulation).
3. Observations were conducted at the Chicken Slaughterhouse location to directly observe the chicken slaughtering process and other operational flows, such as receiving raw materials, slaughtering, carcass handling, and storage. Observations focused on critical points that could potentially pose a risk to the halalness of the product. A non-participatory observation technique was used, and the results were recorded in an observation log to support the validity of the interview data.

Data analysis was conducted using the thematic analysis method, which involved the following stages:

1. Data reduction: filtering out important information from interview transcripts and literature documents.
2. Categorisation and coding: grouping the findings based on the types of risks and mitigation strategies in the halal supply chain.
3. Data presentation: compiling thematic narratives that describe the dynamics and challenges at each critical point of the supply chain.
4. Conclusion drawing and verification: examining the relationship between field results and theoretical frameworks to obtain credible and contextualised conclusions.

To ensure the validity of the data, this research uses source triangulation techniques by comparing data from interviews and literature studies. Although the number of interviewees was limited, the selection of informants with high authority, experience and competence became the basis for justifying the quality of the data. In addition, any information obtained from interviews was confirmed with documents and literature to ensure the consistency and reliability of the findings. The limitations of the research, especially in terms of the number of informants, have been anticipated through an in-depth focus on a specific topic, namely risk mitigation strategies in the halal chicken meat supply chain, as well as the use of relevant literature sources as a form of confirmation and enrichment of data.

### 3. RESULTS

This study mapped the critical risk points within the halal chicken supply chain in Yogyakarta, particularly focusing on Type D poultry slaughterhouses. Data were collected through in-depth interviews with halal auditors and certified RPA managers, direct observations, and literature triangulation. The findings indicate that halal assurance is challenged by various technical, behavioral, and systemic factors throughout the supply chain.

Field data show that upstream actors—such as plasma farmers and feed suppliers—have limited understanding of halal principles beyond slaughtering, leading to uncontrolled risks associated with feed origin and veterinary input [19], [20]. This is consistent with findings by Islam et al. [21], who argued that compliance gaps are often caused by poor upstream traceability.

At the processing level, Type D slaughterhouses typically lack cold-chain infrastructure, dedicated clean zones, and trained personnel, which makes it difficult to ensure full compliance with halal slaughter protocols. These facilities are often located in sub-districts and operate under minimum standards. In contrast, Type A RPAs, which serve broader markets and meet export criteria, apply higher hygiene and documentation standards [3].

The observation logs further highlight cross-contamination risks during transportation and post-processing handling, especially when agents and distributors mix halal and non-halal items due to lack of logistical separation. Similar findings were discussed by Truangsiroj [22], who observed that transportation is a significant weak point in halal assurance for perishable goods.

At the downstream level, retail vendors and small-scale foodservice providers show minimal awareness or commitment to halal verification, often relying on verbal assurances or visual cleanliness instead of certification [23]. As Bonne and Verbeke [8] stated, consumer trust in halal products is tied to the perceived integrity of the entire supply chain—not just the final product label.

The following Table 1 synthesizes key risk points and recommended mitigation strategies based on findings from the field and supported by relevant literature.

**Table 1.** Halal Chicken Supply Chain: Risk Points and Mitigation Strategies

No	Stage	Process	Description	Potential risk	Mitigation Strategy	Actors
1	Upstream	Plasma Farming	Plasma farmers raise broiler chickens with inputs provided by a core company (feed, medicine, technical support).	Lack of control over halal input (feed, vaccine) and low awareness among farmers regarding halal standards.	Use certified halal inputs (feed, medicine) and provide training to farmers.	Farmers, Core Company, Organization for Halal Certification
2	Midstream	Broker and Transaction	Brokers facilitate transactions between sellers and buyers, determining the delivery location to the RPA.	Lack of transaction documentation and unclear halal status of transferred chickens.	Implement proper documentation and verification system for product origin.	Brokers, Core Company, Monitoring Authorities
3	Processing	Slaughtering in RPA Type D	Chickens are slaughtered in conventional RPAs with limited facilities and low quality control.	Non-shariah-compliant slaughtering, no separation of clean and dirty areas, and cross-contamination risks.	Provide regular training for halal slaughterers, periodic audits, and ensure clean-dirty area separation.	halal auditors, slaughterhouse staff, slaughterhouse manager
4	Downstream	Distribution by Agents	Agents distribute chicken from RPAs to wholesalers, restaurants, and retailers.	Cross-contamination during transportation and use of non-designated or unhygienic vehicles.	Use halal-designated vehicles, clear labeling, and train distribution agents.	Distribution agents, slaughterhouse staff, halal inspectors

No	Stage	Process	Description	Potential risk	Mitigation Strategy	Actors
5	Retail & End Consumer	Small Restaurants & Markets	Final sellers prepare and sell chicken to consumers in small restaurants or traditional markets.	Lack of halal labeling and use of ingredients from unverified sources.	Educate sellers on halal labeling and traceability of ingredients.	Local authorities, restaurant/market sellers

These findings align with Sari & Dwi [5], who mapped over 20 risk points in halal chicken supply chains across Indonesia, identifying improper bleeding, temperature abuse, and lack of cold storage as top hazards. Masudin et al. [6] emphasized that quantitative halal risk assessment tools—such as Fuzzy Best Worst Method—can help prioritize intervention points, but require institutional support.

In addition, the concept of *halalan thayyiban*, which extends halal assurance to include cleanliness, safety, and ethical sourcing, remains largely unintegrated into daily practices [24]. According to Farouk [9], this concept is essential in modern halal food systems where consumers increasingly demand transparency and ethical practices—not just ritual compliance.

The integration of National Food Safety Control System (NFSC) principles—emphasizing preventive risk-based monitoring—is seen as a critical enabler of halal integrity at scale. As described by BPOM [16] and reaffirmed in recent field studies [17], NFSC-aligned controls improve cross-agency collaboration, enhance traceability, and support consumer trust.

These results confirm that halal assurance failures are not due to lack of regulation but due to fragmentation, informality, and limited capacity in the value chain. The integration of behavioral insight, policy enforcement, and logistics standardization is crucial to build a resilient halal ecosystem.

#### 4. DISCUSSION

The findings of this study reaffirm that maintaining halal integrity in the broiler chicken supply chain requires more than just regulatory frameworks—it demands behavioral change, institutional alignment, and technological adoption. While Government Regulation No. 42 of 2024 has provided a clear legal mandate, challenges persist in translating these standards into consistent operational practices across all nodes of the supply chain.

One of the most critical issues is the limited upstream awareness of halal requirements, particularly at the level of plasma farmers and feed suppliers. According to interview findings, halal risks in the poultry farming are thoroughly linked to animal welfare. A primary concern is microbial cross-contamination among livestock. Unfit or unsuitable chickens must be carefully culled to avoid disease transfer to other flocks. This procedure requires stringent oversight to prevent the exploitation of carcasses, including their repurposing for aquaculture feed or sale without clear notification of their condition. Agricultural operations must adhere to disposal protocols established by the Department of Veterinary Services. Transportation provides an additional risk factor. From a halal standpoint, vehicles used for transporting live chicks must be sanitary, free from any impure or prohibited ingredients, and must not be overloaded to the extent that the animals suffer stress or harm. Ramli et al. [25] highlight that the absence of structured halal risk assessments at hatchery and farming stages can compromise the entire downstream supply chain. This is echoed by Kurniawan et al. [26], who argue for the importance of traceability systems powered by digital technologies like blockchain and IoT to improve monitoring and documentation of feed inputs, animal welfare, and vaccination procedures.

At the processing stage, particularly in Type D slaughterhouses, the findings show a lack of infrastructure and standard operating procedures for clean-dirty segregation, stunning methods, and hygiene control. This aligns with the observations of Al Shamy & Abdullah [27] who point out that fragmented understanding of halal slaughter standards and inconsistencies in religious training contribute to the persistence of non-compliance. Moreover, unlike Type A RPAs, Type D facilities often lack internal halal control teams or trained auditors, further widening the compliance gap.



The distribution phase introduces its own set of vulnerabilities. Without dedicated halal-certified logistics systems, chicken products are transported alongside non-halal items or in poorly sanitized vehicles. Studies by Adhiwibowo et.al. [28] demonstrate that halal logistics value creation is deeply influenced by a firm's commitment to segregated transport, labeling, and cold-chain management. These elements are often lacking in traditional Indonesian poultry supply chains, especially among SMEs.

At the retail level, the behavioral dimension becomes increasingly influential. Aslan [23] shows that consumers' trust and purchase intention are shaped not only by certification logos but also by the visibility of halal practices, vendor behavior, and environmental hygiene. This reinforces the necessity for public-facing halal literacy campaigns and retail-level monitoring by local authorities.

Furthermore, the broader concept of *halalan thayyiban*—which combines religious permissibility with safety, cleanliness, and ethical treatment—remains largely underimplemented in the field. While national regulations like NFSC (National Food Safety Control System) provide a strong foundation for integrated food governance [16], adoption at the SME level remains limited due to cost and knowledge barriers.

Addressing these multifaceted challenges requires a strategic framework that not only enforces regulations but also empowers actors at each level of the halal supply chain. A critical starting point is the digitalization of halal traceability. The integration of blockchain systems and QR-based traceability platforms has shown promising results in countries like Malaysia and the UAE, enabling transparent monitoring of feed origin, slaughter documentation, and distribution flows [29]. In Indonesia, however, adoption remains limited due to infrastructure gaps and digital literacy barriers among SMEs. To bridge this, pilot projects and government-backed halal tech incubators can serve as catalytic platforms for adoption.

Institutional capacity building is equally vital. Beyond routine certification audits, training modules tailored for slaughterhouses personnel, including ethical slaughter techniques and hygiene protocols, are needed to instill sustainable halal practices. Hashim and Sharif [30] found that localized, context-sensitive training significantly increased compliance levels in informal slaughter facilities. Moreover, the deployment of mobile halal verification units—equipped with inspection tools and rapid certification mechanisms—can extend monitoring reach into under-regulated areas.

Another vital dimension is the standardization of halal logistics, which often remains overlooked. Incorporating halal-specific protocols in transportation—including cargo segregation, vehicle sanitation, and tamper-proof labeling—has been found to directly reduce cross-contamination risks, particularly in cold chain environments [31]. This aligns with the findings of Ziegler et al. [32], who emphasize the integration of halal logistics into broader national food safety policy to ensure chain-wide consistency. Finally, behavioral transformation across stakeholders must be cultivated, as illustrated in Figure 2.

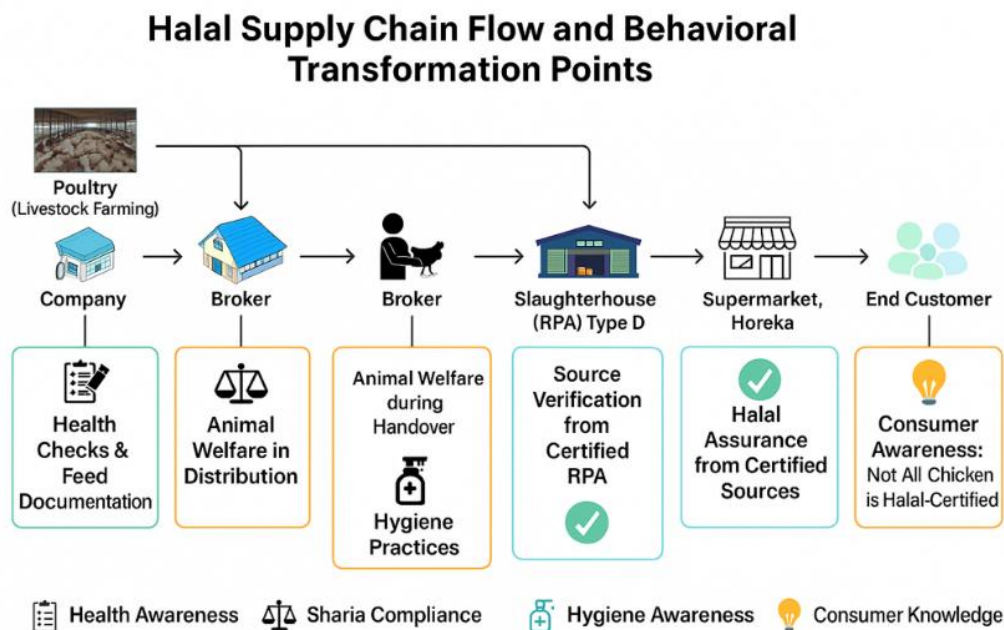


Figure 2. Halal Supply Chain Flow and behavioral Transformation Points

This includes not only downstream players such as retailers and food vendors but also upstream suppliers. Figure 2 highlights key behavioral transformation points across the halal chicken supply chain from poultry farmers and brokers to slaughterhouse operators, distributors, retailers, and end customers. Specific awareness efforts include animal health monitoring and feed and vaccine documentation at the farm level, attention to animal welfare and hygiene practices during distribution and slaughter, and verification of halal-certified sources by wholesalers and retailers. At the customer level, the emphasis shifts toward increasing public awareness that not all chicken meat on the market is halal-certified. With these flow it can be enhance halal supply chain chicken meat traceability.

Community-based halal awareness programs and religious leader engagement have proven effective in improving halal literacy and voluntary compliance [33]. All of these measures should be integrated within a national halal governance ecosystem, such as Indonesia's NFSC, to ensure coherence, accountability, and system-wide scalability.

This study is constrained by the limited number of interview participants, including just two key informants: a halal certification auditor and a representative from a halal-certified poultry factory. The selection was predicated on their direct engagement and comprehensive understanding of halal assurance methods. Nevertheless, due to scheduling and accessibility limitations, interviews could not be extended to include other stakeholders such as farmers, transporters, or regulatory agencies. Consequently, the findings may not comprehensively encompass the many opinions and behaviours within the halal poultry supply chain. This increased engagement would give a more thorough awareness of halal compliance difficulties and practices at each level of the supply chain, and assist uncover systemic gaps that require coordinated solutions.

## 5. CONCLUSION

This study highlights the systemic challenges and risk points within the halal broiler chicken supply chain in Yogyakarta, particularly in Type D slaughterhouses that cater to local markets. By adopting a qualitative case study approach involving certified slaughterhouses and halal auditors, the research identified critical vulnerabilities related to upstream input traceability, slaughterhouse practices, logistical handling, and retail-level awareness. These challenges persist despite the implementation of Government Regulation No. 42/2024 and reflect a deeper need for behavioral change, technological integration, and coordinated policy enforcement.

Findings indicate that halal integrity cannot be ensured through certification alone. Rather, it requires a comprehensive governance model that combines technological tools (e.g., digital traceability and mobile audit systems), infrastructure development (e.g., zoning and logistics segregation), and multi-stakeholder behavioral alignment. The application of the *halalan thayyiban* concept—integrating ethical, hygienic, and spiritual values—should guide not only regulation, but also grassroots practices.

As Indonesia aims to position itself as a global halal hub, strengthening national frameworks such as the NFSC becomes essential. This study contributes to that vision by offering grounded insights and mitigation strategies that can inform policy reform and operational standards. Future research should extend this analysis by incorporating consumer-side trust dynamics, involving more upstream actors in the halal poultry supply chain, and testing the scalability and acceptance of halal innovation technologies—including digital halal traceability systems— across diverse regional contexts. These steps are essential to developing a more robust, transparent, and inclusive halal ecosystem.

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