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Halal assurance beyond science: A perspective on socioeconomic factors and consumer trust in food authentication

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Abstract

Halal assurance within the global food system has traditionally relied on scientific verification methods such as chromatographic, spectroscopic, genomic and immunological analyses to authenticate and determine product compliance with Islamic dietary laws. While these methods remain critical and essential for detecting non-compliant contaminants, this article argues that scientific validation alone is insufficient to foster consumer confidence and trust in halal certification. Drawing on an interdisciplinary synthesis of food science, analytical chemistry, sociology, economics, and religious studies, this article explores how socioeconomic and cultural factors, including education, income, religious literacy, cultural identity, and institutional credibility, influence consumer perceptions and acceptance of halal-certified products. The analysis also reveals that these sociocultural dimensions are significant in legitimising halal governance frameworks and sustaining public trust. This article recommends advancing halal literacy, enhancing transparency in certification processes, adopting participatory and inclusive governance models and utilising digital traceability tools to strengthen the integrity and inclusivity of halal certification systems. Hence, by expanding halal assurance beyond laboratory-based validation, this study calls for a more holistic, socially attuned and equitable approach to halal authentication that reflects the complexity of contemporary worldwide markets and the diverse expectations of Muslim consumers.

1. Introduction

The contemporary discourse on halal assurance has undergone a significant paradigm shift, moving beyond purely scientific verification methodologies toward an integrated understanding encompassing complex socioeconomic dimensions. Meanwhile, the analytical authentication methods are fundamental to halal authentication for certification, particularly for detecting pork, boar, swine, their derivatives, or ethanol content, as they provide objective, reproducible and scientifically validated evidence to ensure compliance with halal standards and prevent cross-contamination or intentional adulteration in food and pharmaceutical products. However, these scientifically-approach methods represent only one aspect of a complex ecosystem influenced by cultural values, economic interests and evolving customer expectations (Lubis *et al.*, 2016). As such, the assurance of halal integrity cannot rely solely on laboratory analyses but must also consider the sociocultural and ethical underpinnings of the trust. Consumer trust, particularly, should be anchored not in anecdotal legitimacy, but in verified knowledge (*'ilm*), trustworthiness (*amanah*) and credibility (*thiqah*), which are the foundational values in Islamic epistemology. This expanded perspective recognises that halal food systems exist within broader networks of social relations, economic structures and trust mechanisms that fundamentally influence how *halal* integrity is understood, maintained and negotiated in global marketplaces (Othman & Md Nawi, 2025; Ng *et al.*, 2022).

An exclusively scientific approach to halal authentication has limitations, especially considering the sociological dimensions of consumer trust formation. Scientific testing can verify the absence of forbidden (*haram*) ingredients; however, it cannot adequately address the socially constructed nature of authenticity that emerges through community endorsement, authority recognition and lived experience. Muslim consumers often navigate halal choices through complex webs of social capital, trusted relationships, and community knowledge parallel to formal certification mechanisms. These dynamics create rich cultural landscapes where halal assurance is continuously negotiated through interpersonal connections rather than solely through laboratory analysis (Amid, 2024; Sani *et al.*, 2023). Nevertheless, it is equally crucial to recognise that halal authenticity cannot rest on social construction alone. It must be firmly rooted in *shari'ah*-compliant evidence drawn from Islamic jurisprudence and verified methodologies rather than perception or communal consensus. This dual emphasis ensures that Muslim consumers' sociocultural realities and the

Islamic law's foundational principles are upheld in the halal assurance ecosystem.

The economic dimensions of halal certification further complicate authentication practices, creating tension between profit motives and integrity toward the religion (Bux *et al.*, 2022). As the global halal market expands into a multi-trillion-dollar industry, halal certification has evolved from a religious service into a significant commercial enterprise associated with pressures and incentives. This commodification process raises critical questions about accessibility, power dynamics and whether economically marginalised communities can meaningfully participate in formal halal authentication systems (Mohd Fauzi *et al.*, 2020). Therefore, the political economy of halal certification requires inquiry alongside scientific methodologies to understand how economic factors shape authentication practices and outcomes. Moreover, contemporary scholars increasingly emphasise how halal authentication practices reflect broader societal values regarding transparency, ethical consumption and food sovereignty. This evolving discourse acknowledges that halal assurance exists within complex global networks where power differentials between producers, certifiers and consumers create uneven landscapes of knowledge and authority. While economic growth has expanded halal certification into a global enterprise, this need not come at the expense of religious integrity. Economic profit and *Shari'ah* compliance must coexist through transparency, accountability and trust principles. Upholding *shari'ah*-based standards ensures consistency, inclusivity and integrity across the global halal ecosystem, anchoring halal certification practices through Islamic law while responding to contemporary market realities. (Islam *et al.*, 2023).

This article aims to explore the dimensions of halal assurance that extend beyond the scientific authentication methods, emphasising the crucial role of socioeconomic factors and consumer trust in the halal food ecosystem. While stringent regulatory frameworks and the availability of sophisticated laboratory techniques are critical pillars for ensuring the integrity of halal certification, they alone are insufficient to fully secure consumer confidence, particularly in a diverse and globalised market (Yuswan *et al.*, 2020). This article also explores how education, income, cultural background, religious knowledge and institutional credibility influence consumer perceptions and acceptance of halal-certified products. Notably, it is important to distinguish that while these socioeconomic variables are relevant for understanding consumer behaviour and market engagement, they should not be incorporated into the formal criteria for halal assurance. The determination of halal status must remain rooted in clear and objective rulings derived from Islamic jurisprudence (*Shari'ah*), which are universally applicable and not subject to sociocultural variation. Introducing context-dependent factors into the halal certification process risks compromising the standardisation and theological integrity of halal. By synthesising findings from various interdisciplinary studies of food science, sociology, economics and religious studies, this article offers a comprehensive understanding of the multifaceted factors influencing consumers in halal authentication, reaffirming that *Shari'ah* compliance remains the non-negotiable foundation of halal certification. The scope of this article includes a discussion of the limitations of current scientific approaches. These sociocultural dynamics impact halal food assurance and strategic recommendations for enhancing the integrity and credibility of halal certification systems in both local and international contexts.

2. Literature review

2.1 Overview of scientific methods and sociocultural challenges in halal authentication

The scientific authentication of halal products represents a complex intersection of religious requirements and analytical methodologies, establishing objective verification frameworks within a domain traditionally governed by religious authority. Furthermore, contemporary halal certification bodies increasingly establish sophisticated laboratory techniques to detect prohibited substances with remarkable sensitivity, creating standardised verification protocols that operate across diverse production contexts. High-Performance Liquid Chromatography (HPLC) has emerged as a valuable analytical tool in halal verification, enabling technicians or operators to separate, identify and quantify components within complex food matrices. This chromatographic approach quantifies various food additives and contaminants, which are critical in processed foods for ensuring product safety and regulatory compliance. The sensitivity of modern HPLC systems enables detection at parts-per-million levels, guaranteeing unintentional consumption of prohibited substances that might be present in trace amounts yet still violate religious requirements. Complementing these chromatographic approaches, the Gas Chromatography Mass Spectrometry (GC-MS) techniques offer powerful capabilities for identifying volatile compounds, proving especially valuable in detecting porcine-derived additives and other non-*halal* components that may be incorporated into complex food formulation (Rohman & Windarsih, 2020).

DNA-based authentication methodologies have revolutionised halal verification practices, enabling species identification with unprecedented precision. The Polymerase Chain Reaction (PCR) techniques allow certification laboratories to amplify and detect species-specific genetic markers, particularly those indicating porcine contamination in meat products, gelatine-containing foods and pharmaceutical formulations. The remarkable sensitivity of real-time PCR enables the detection of porcine DNA at concentrations below 0.1%, addressing concerns about cross-contamination in shared production facilities where halal and non-halal products might be processed. These genomic approaches have proven particularly valuable in complex supply chains where visual inspection and traditional verification methods prove inadequate for detecting adulterations or substitutions. Immunological techniques such as Enzyme-Linked Immunosorbent Assay (ELISA) offer complementary capabilities by targeting specific proteins characteristic of prohibited species, providing rapid screening tools that can be employed in field settings where sophisticated laboratory infrastructure might be unavailable (Aprilia *et al.*, 2022; El Sheikha *et al.*, 2017).

The scientific aspects of halal authentication extend beyond laboratory analysis to encompass standardised production protocols that govern the manufacturing process. Organisations such as the Standards and Metrology Institute for Islamic Countries (SMIIC) and the Malaysian Standards Department, as well as the Malaysian Standard (MS1500), have developed comprehensive guidelines that codify religious requirements into technical specifications applicable across industrial settings (Azam & Abdullah, 2021; Ahmad *et al.*, 2018). These standards address critical control points

throughout production, including animal welfare considerations, stunning parameters, slaughter techniques, blood drainage requirements and cross-contamination prevention measures. Certification bodies such as the Department of Islamic Development Malaysia (JAKIM) implement these standards through systematic audit protocols that combine on-site inspections, documentation reviews, and periodic laboratory testing to verify ongoing compliance. The development of these standardised frameworks represents a significant achievement in translating religious principles into operational parameters that can be consistently applied and objectively verified across diverse production contexts.

In the meantime, traceability systems represent another crucial scientific dimension of contemporary halal authentication frameworks, enabling verification of product provenance and processing history throughout complex global supply chains. Digital traceability solutions incorporating blockchain technology have emerged as particularly promising approaches to maintaining halal integrity across multiple production stages and geographic boundaries. These systems create immutable digital records documenting compliance at each production phase, addressing authentication challenges when products traverse numerous jurisdictions with varying halal standards and certification requirements. Traceability mechanisms can confirm that all production inputs, including processing aids, packaging materials, and cleaning agents, meet halal standards and mitigate concerns regarding concealed non-compliance that may arise at upstream supply chain stages. This addresses concerns regarding hidden or inadvertent non-compliance at upstream supply chain stages. Furthermore, advanced traceability systems progressively integrate quick testing methods, facilitating real-time verification at essential control points. The establishment of multifaceted authentication methods integrates documentary proof with analytical methods to deliver through halal certification (Abd Rahman *et al.*, 2017).

The halal assurance system is a structured framework designed to ensure that food and other consumer products comply with *Shari'ah* at every stage of the supply chain. It comprises a set of operational components, including traceability mechanisms, critical control points, standard operating procedures and compliance audits, whereby each is aligned with the core objective of maintaining halal integrity from farm to fork. Most certification bodies necessarily operationalise specific Islamic legal schools (*madhhabs*) of *Hanafi*, *Maliki*, *Shafie* and *Hanbali* or interpretative frameworks, creating standardised protocols such as ingredient analysis, slaughter procedures, manufacturing practices and transportation oversight, that may not accommodate the full diversity of legitimate religious perspectives on halal requirements (Hamizar *et al.*, 2024). This standardisation process frequently emphasises aspects of halal that are amenable to quantification and objective verification while downplaying equally important dimensions that resist such measurement. While presenting as neutral technical systems, the resulting certification frameworks often embed specific cultural interpretations and religious judgments within seemingly objective scientific methodologies. This dynamic becomes particularly problematic in global markets where diverse Muslim communities may hold varying interpretations of halal requirements yet encounter standardised certification systems that inadequately reflect their specific religious understandings. The political economy of halal certification further complicates this landscape, as the interplay of economic interests and political power enables dominant market actors to disproportionately influence the interpretations of halal requirements formally encoded in verification standards (Noordin *et al.*, 2014).

Most fundamentally, scientific approaches to halal verification inadequately address the sociological dimensions of trust formation that ultimately determine consumer acceptance of halal claims. While grounded in technical accuracy and scientific rigour, laboratory certification derives its ultimate legitimacy not solely from these attributes but from the complex social processes through which religious authority is constructed, recognised and maintained within communities (Van der Spiegel *et al.*, 2012). Ethnographic research consistently demonstrates that Muslim consumers often prioritise personal relationships, community endorsements, and recognised religious authority over technical certifications when making halal consumption decisions. Scientific verification systems that fail to engage meaningfully with these social dimensions of trust frequently find their certifications carrying limited practical authority despite technical rigour. This social dimension becomes particularly evident in diaspora contexts where Muslim communities negotiate halal consumption within non-Muslim majority societies, often developing elaborate trust networks and verification practices parallel to formal certification systems. These community-based authentication approaches reveal how halal verification fundamentally operates as a social process embedded within specific cultural contexts rather than merely as a technical procedure isolated in laboratory settings.

2.2 Socioeconomic factors influencing halal perception

The halal perception among consumers extends far beyond the boundaries of scientific validation and is significantly influenced by various socioeconomic factors. These include the education level, income, occupation, religious adherence, cultural background and access to halal-certified products, all of which shape consumer attitudes and trust toward halal authentication. For example, individuals with higher socioeconomic levels in educational attainment, income levels, social class, and occupation tend to understand halal certification standards better. They are more critical of labelling and source verification (Bonne & Verbeke, 2008). Education often enhances the ability to question and interpret complex labelling or certification claims, leading to an increasing inquiry into the halal logo and a stronger demand for a transparent traceability system. Additionally, education enables individuals to better comprehend the nuances between halal certification bodies, especially in regions where multiple and sometimes conflicting halal authorities exist.

Moreover, it is noted that income level also plays a crucial role in halal consumption behaviour. Following Awan *et al.* (2015), higher-income consumers may prioritise health, hygiene, and religious values and be more willing to pay premium prices for authenticated halal products. Conversely, lower-income groups might rely more on price and accessibility, potentially compromising their halal preference if such products are unaffordable or unavailable. Occupational status can similarly influence halal perception, especially among urban professionals frequently exposed to diverse food systems and global halal markets. These individuals may develop heightened sensitivity to halal integrity due to frequent exposure to high levels, international trade and a broader

worldwide context (Lever & Miele, 2012).

Besides that, religious commitment and cultural environment strongly shape halal consciousness. In predominantly Muslim societies, halal is often culturally embedded, resulting in automatic trust in local food systems. However, in non-Muslim or multicultural settings, consumers may exhibit scepticism about the authenticity of halal claims, prompting reliance on formal certifications and third-party assurance (Lada *et al.*, 2009). For example, cultural context mediates this behaviour; in Muslim-majority countries such as Malaysia, Indonesia or Saudi Arabia, halal is embedded in national policy, and public trust in local halal governance is relatively high. Conversely, in secular or non-Muslim-majority countries, Muslim minorities may display increased scepticism and seek multiple layers of assurance, including endorsement from international halal bodies, personal inquiries or community networks to verify halal compliance. This often leads to localised halal trust systems, where social and communal endorsement play an equal or greater role than formal education (Wilkins *et al.*, 2019).

The socioeconomic factors also play a central role in understanding consumer trust and perceptions regarding halal authentication. These factors do not act in isolation but interact dynamically with education level, income, occupation, religious adherence, cultural background, and access to halal-certified products. Therefore, a comprehensive halal assurance strategy must go beyond scientific verification methods to integrate socioeconomic insights, ensure equitable access to information, and reinforce institutional credibility. Tailoring halal governance frameworks and communication strategies to reflect the socioeconomic diversity of consumers can significantly enhance trust, compliance and the integrity of the global halal food system.

2.3 Consumer perception in halal food authentication and halal certification body

Consumer trust plays a vital role in the effectiveness and credibility of food authentication systems, particularly within the context of halal assurance, where religious, ethical and cultural considerations intersect with scientific validation. In the halal assurance system, consumer trust is an outcome, not a criterion of rigorous *Shari'ah* compliance, technical verification and consistent certification by recognised authorities. Trust is earned through transparency, integrity and adherence to established standards, not merely through perception or cultural sentiment. Trust is not solely built upon the technical accuracy of food testing methods such as FTIR spectroscopy, DNA analysis, and chromatography, but also upon the perceived integrity, transparency, and reliability of the institutions and certification bodies responsible for the halal governance (Kua, 2022). However, trust is multidimensional, encompassing confidence in the regulatory framework, belief in the consistency of certification standards, and assurance in the enforcement mechanisms behind halal labels. When consumers perceived food authentication processes to be transparent, standardised and endorsed by credible religious authorities, their willingness to accept halal labels increased significantly (Aziz & Chok, 2013).

However, in contexts with a lack of centralised regulation, inconsistencies among certification bodies or incidences of fraud, such as mislabelling non-halal ingredients, consumer trust can erode rapidly, even if advanced scientific methods are employed. Furthermore, the globalisation of food supply chains has made halal authentication more complex and transnational, requiring consumers to trust not just local authorities, but also international halal certifiers and multinational manufacturers. In such scenarios, trust is often contingent upon perceived institutional legitimacy, historical performance and alignment with religious values (Tieman, 2011). Studies have shown that Muslim consumers tend to rely on both formal (certification logos, government agencies) and informal (religious community, social media reviews, word-of-mouth) trust mechanisms to validate halal status, especially in non-Muslim-majority countries where halal governance is fragmented or voluntary (Golnaz *et al.*, 2010).

Moreover, it is noteworthy that technological tools such as blockchain, QR code traceability, and halal mobile apps are emerging as facilitators of consumer trust by offering greater transparency and access to supply chain information (Zailani *et al.*, 2015). The effectiveness of these technologies is influenced by socioeconomic factors, including digital literacy, education and income, which determine the extent to which consumers can access and understand authentication data. In conclusion, fostering and sustaining consumer trust in food authenticity demands more than stringent laboratory analysis; it requires a holistic, multi-stakeholder strategy incorporating religious legitimacy, institutional transparency, effective communication and cultural sensitivity. Ensuring the reliability of halal food authentication systems is a socio-technical challenge that integrates research, regulation and public perception.

2.4 Significance of religious devotion and wisdom

Religious devotion and wisdom are fundamental drivers influencing consumer perceptions, decisions and trust in halal food authentication. For Muslim consumers, halal consumption is not merely a dietary preference, but a religious obligation grounded in Islamic jurisprudence (*Shari'ah*). Therefore, the degree of a consumer's religious devotion, defined by the extent to which Islamic teachings are internalised and practices, profoundly affects the vigilance with which they assess the halal status of food products (Mukhtar & Butt, 2012; Lada *et al.*, 2009). Highly committed Muslim individuals are more likely to seek certified halal products, question ambiguous ingredients, avoid cross-contaminated foods and engage in active verification of halal claims. A spiritual imperative often influences their decisions to ensure that what they consume is both halal (permissible) and *toyyib* (wholesome), aligning dietary choices with their broader religious and ethical values.

Religious knowledge further reinforces this devotion by equipping Muslim consumers with the ability to interpret labels, understand certification processes and critically evaluate the credibility of certifying bodies. According to Bonne and Verbeke (2008), Muslim consumers with a thorough understanding of Islamic dietary laws are more likely to distinguish between superficial halal claims and verified halal certifications endorsed by religious authorities. This knowledge allows them to navigate complex food systems, particularly in multicultural and multi-certification environments, such as Western or secular countries, where halal regulations are less centralised. In such contexts, knowledge protects against misinformation and fraud, reducing reliance on mere packaging symbols or unverified marketing claims. Nevertheless, halal education, whether formal or informal, can influence consumer behaviour across generations. Younger Muslim consumers who received halal

education are more likely to maintain halal observance in adulthood, especially when such knowledge is complemented by modern awareness tools, such as mobile halal applications, community-based learning or engagement with halal influencers and religious scholars (Ramli *et al.*, 2023). Importantly, halal education also plays a mediating role in resolving ambiguity when facing uncertain or borderline products, such as emulsifiers, enzymes, and flavouring. Consumers often follow fatwas, local religious authorities, or halal certification guidelines to guide their decisions. This behaviour demonstrates that trust in halal food is not formed solely through institutional labelling, but through a dynamic interplay between internal religious consciousness and external validation mechanisms (Idris, 2025; Riofita & Iqbal, 2022).

Religious devotion and knowledge of halal education significantly shape how halal authentication is perceived and acted upon. These factors affect both the cognitive (knowledge-based) and affective (faith-based) dimensions of consumer trust, reinforcing the need for halal certification systems to align with scientific rigour and theological clarity and accessibility. Strengthening Islamic and halal education among consumers while ensuring that certification processes remain transparent, standardised and religiously grounded can enhance consumer confidence and fortify the integrity of the halal food ecosystem.

2.5 Credibility of halal certification bodies and authorities

The credibility of halal certification bodies plays a crucial role in establishing consumer trust in halal-certified food products. Although scientific tools are essential in verifying ingredients and processes, consumers ultimately rely on halal certification marks as the visible assurance that a product complies with Islamic dietary laws. In this context, the trustworthiness of the halal certifying body becomes a proxy for the integrity of the entire halal food authentication process. In countries like Malaysia, Indonesia and Singapore, centralised government-endorsed institutions such as JAKIM (Department of Islamic Development Malaysia), BPJPH (Halal Product Assurance Organising Agency) and MUIS (Islamic Religious Council of Singapore) are recognised as authoritative and competent, mainly because of their alignment with both *Shari'ah* principles and regulatory oversight mechanisms (Arsil *et al.*, 2018). Their involvement lends legitimacy to halal claims domestically and in international trade, where their logos are accepted in global markets due to high compliance standards and international cooperation.

On the other hand, the halal certification framework in non-Muslim-majority nations is frequently decentralised and characterised by an abundance of private certifiers with differing degrees of competence and religious legitimacy. This abundance of private halal certifiers has resulted in considerable confusion among customers who may lack familiarity with the varying standards, logos and methods employed by these halal certifying organisations. Aniqoh & Hanastiana's (2020) research shows that many European Muslim consumers struggle to differentiate between trustworthy and questionable halal certification marks, particularly without a central regulatory authority. This fragmentation undermines the perceived credibility of the halal assurance system and opens the door to fraud, mislabelling or inconsistent auditing practices, ultimately eroding consumer confidence. A significant factor contributing to the credibility of halal certification bodies is their transparency and governance structure. Credible halal certification authorities typically publish clear certification procedures, publicly disclose their auditing practices and include qualified *Shari'ah* scholars in their decision-making process.

Talib *et al.* (2015) emphasise that consumers are likelier to trust halal certification bodies that practice transparent decision-making and involve Islamic jurists to oversee *fatwa* processes and religious rulings. On the other hand, halal certification agencies that operate behind closed doors or do not maintain religious accountability often face scepticism from both consumers and manufacturers. The perceived opacity of such agencies can be interpreted as a sign of weak institutional integrity, especially considering past scandals involving fraudulent or expired halal certification (Asa, 2019). Moreover, the ability of a certification body to operate within a globalised supply chain has become a key component of its credibility. As halal-certified products are increasingly traded across borders, consumers expect certifiers to maintain consistent standards, even when dealing with international suppliers and manufacturers. Mutual recognition agreements (MRAs) between halal certification authorities, especially those based on internationally recognised standards such as MS1500:2019 or OIC/SMIIC, help to build consumer trust by ensuring that halal compliance is maintained throughout the global supply chain (Latif, 2020).

Without such agreements, consumers may view foreign halal certifications with suspicion, particularly if the certifying body is unknown or not endorsed by a local religious authority. Therefore, cross-border credibility and cooperation among halal certification authorities are crucial for strengthening international trust. In addition to technical competence and regulatory reach, the ethical reputation of certification bodies significantly influences consumer perception. Halal certification bodies perceived as profit-driven, politically compromised or lacking moral integrity are often distrusted, even if their procedures appear scientifically sound. This is due to halal assurance, which is not only about compliance but also about moral legitimacy. Consumers expect halal certifiers to act according to Islamic ethical standards, encompassing honesty, accountability, and concern for the *ummah* (Muslim community). Certification bodies that demonstrate social responsibility, engage with religious scholars and respond swiftly to public concerns are more likely to retain consumer trust during times of controversy or crisis (Che Azmi *et al.*, 2020).

Notably, the credibility of halal certification bodies and authorities is a multidimensional construct encompassing regulatory competence, religious legitimacy, global consistency and ethical behaviour. While science can determine the physical presence or absence of non-halal substances, the institutional reputation of halal certifying bodies conveys the assurance of religious compliance. As consumers become more informed and the halal market becomes more competitive, the ability of halal certification bodies to build and maintain trust through transparent, accountable and religiously grounded practices becomes increasingly vital. Without credible and competent certifiers, the halal authentication system risks being undermined, especially in multicultural and cross-border contexts where faith and global food trends shape consumer expectations.

2.6 Challenges in integrating socioeconomic dimensions into halal assurance

Integrating socioeconomic dimensions into halal assurance presents a significant challenge, as most current systems prioritise scientific and technical criteria while underestimating the influence of social, economic and cultural factors on consumer trust and compliance. Halal assurance is a scientific process and a social construct reflecting religious values, financial accessibility and community dynamics. A recent article published by Marzuki *et al.* (2021) has highlighted the growing disconnect between the highly regulated, standardised frameworks of halal certification and the diverse socioeconomic realities of Muslim consumers across various regions. The rigid application of halal standards often overlooks marginalised communities who may adhere to halal principles but lack access to certified products or information due to economic and geographical limitations.

Economic inequality is a significant impediment to equitable halal assurance. In many developing countries, halal-certified products are often priced higher due to certification costs, specialised logistics and regulatory compliance. The result renders them less attainable for low-income consumers, with price frequently taking precedence over certification status, particularly when halal-certified alternatives are scarce or considerably more costly (Muhamed *et al.*, 2019). Moreover, small-scale producers, particularly from informal or rural sectors, face steep entry barriers to obtaining halal certification, including high application fees, audit costs and language barriers. In addition to restricting their access to markets, this also keeps regional halal practices from being officially acknowledged within the certification ecosystem, exacerbating socioeconomic inequality in the halal supply chain (Basir *et al.*, 2018).

Correspondingly, the urban-rural disparity adds another layer of complexity whereby urban populations generally benefit from well-regulated retail networks, increased availability of certified halal products and digital tools able to verify authenticity. Rural communities, on the other hand, often depend on informal markets and traditional practices where halal assurance is assumed but not documented or certified. This reliance on trust and local knowledge can lead to inconsistency in halal compliance and expose consumers to risks, especially as supply chains become more complex (Latiff *et al.*, 2020). Context-sensitive halal assurance models that include mobile auditing units, community-based certification, or tiered certification schemes for rural micro-enterprises are needed to bridge this gap. Moreover, the lack of adaptability within certification systems to accommodate cultural and socioeconomic diversity further hinders integration. Many halal standards are standardised at national or international levels without meaningful engagement from diverse stakeholders such as indigenous Muslim communities, women entrepreneurs or informal vendors. These diverse stakeholders may operate according to Islamic principles but are excluded from formal certification due to bureaucratic rigidity or limited institutional support. As Sari *et al.* (2024) highlighted, halal certification bodies must broaden their scope to include community-led standards and grassroots input, ensuring that certification aligns with religious principles and social equity.

2.7 Opportunities and recommendations for strengthening consumer trust

Consumer trust is essential to the success of any halal assurance system. In an increasingly complex and globalised food supply chain, halal consumers demand transparency, accountability and religious integrity in product authentication. Opportunities for strengthening trust go beyond scientific testing and regulatory enforcement as they foster social inclusion, enhance awareness and create transparent systems that resonate with the values and expectations of diverse consumer groups. As halal becomes a global market force, certification authorities and stakeholders must respond to these evolving expectations with innovative strategies that address technical compliance and socioeconomic dimensions (Hashim *et al.*, 2022).

One key opportunity lies in enhancing halal literacy among consumers. These consumers are more likely to trust halal products when they understand the certification process, recognise official logos, and distinguish between authentic and false claims. Moreover, educational campaigns using digital platforms, religious institutions and community-based organisations can help bridge the knowledge gap, especially among low-income or less-educated groups (Norazmi & Kamaruddin, 2019). Schools, universities and mosques can act as conduits for spreading awareness of halal standards, empowering consumers to make informed choices and reducing susceptibility to misinformation or fraud. Next, adopting digital technologies presents another promising pathway because the technologies allow consumers to trace a product's halal status from farm to fork, enhancing transparency in supply chains (Harsanto *et al.*, 2024). For instance, blockchain-enabled platforms can store immutable records of slaughtering processes, ingredients sourcing and certification history, addressing common consumer concerns over authenticity and tampering. Governments and halal authorities should invest in and subsidise the development of such technologies, particularly for use in rural and underserved areas.

Building inclusive and tiered certification systems ensures equitable access to halal assurance. Many small businesses and home-based producers follow halal practices but are excluded from certification due to bureaucratic and financial barriers. Developing simplified, localised certification models such as the community-based or regional endorsements can help integrate these producers into the formal system without compromising religious compliance (Ratnasari *et al.*, 2019). This approach not only expands the certified halal ecosystem but also increases consumer trust in grassroots food providers who are often already trusted informally by their communities. Meanwhile, transparency and credibility of certification bodies play a pivotal role in trust-building, where conflicts of interest, inconsistent enforcement and lack of public engagement can erode confidence in certifiers. Encountering this, certification bodies should improve their governance structures, publish audit outcomes and engage religious scholars and consumer representatives in standard-setting processes (Nusran *et al.*, 2023). Transparency in decision-making and grievance mechanisms will ensure accountability and reassure consumers that certification is rigorous and impartial. Publicly accessible databases of certified products and businesses can further enhance confidence in halal assurance systems.

Besides, strengthening cross-border cooperation and harmonisation of halal standards is another area of opportunity. The fragmentation of halal certification where different countries or agencies apply differing standards confuses consumers and weakens trust in imported products. Regional or global standardisation efforts, led by organisations such the Standards and Metrology Institute for Islamic Countries (SMIIIC), can harmonise expectations and simplify recognition of halal-certified goods across markets (Abdullah & Abdul Razak, 2020). Such efforts must be balanced with respect for local cultural and jurisprudential differences while maintaining a shared minimum standard to uphold credibility. Finally, engaging the wider halal ecosystem including media, religious leaders, youth influencers and civil society is essential to cultivate the culture of integrity and vigilance. Community-based monitoring systems, consumer feedback platforms and whistleblower protections can enable public participation in halal oversight, thereby democratising the assurance process (Antara *et al*., 2016). Certification authorities must treat consumers not only as end-users but as active stakeholders in maintaining halal integrity. Trust is not built solely through labels and logos, but through transparency, participation and alignment with sincerely held religious and social values.

In conclusion, strengthening consumer trust in halal food authentication requires a multi-pronged approach that blends technological innovation, inclusive governance, education and community engagement. By moving beyond a purely technical paradigm and embracing the socioeconomic realities of diverse consumer groups, halal authorities and stakeholders can build a resilient, equitable and trustworthy assurance system. These efforts must be continuous, adaptable and rooted in a shared commitment to religious principles, consumer protection and public accountability.

3. Conclusion

This article reaffirms that while scientific validation is foundational to halal assurance, it is not the sole determinant of consumer trust or acceptance. Notably, socioeconomic variables such as education, income, occupation, religious commitment and cultural context play critical roles in shaping how consumers perceive and engage with halal-certified products. The credibility of halal certification bodies, the accessibility of halal-certified products and the visibility of ethical governance further affect public confidence in the halal ecosystem. To ensure sustainable trust in halal authentication, stakeholders must embrace a socio-technical approach that combines rigorous scientific standards with religious legitimacy, transparent communication and inclusive practices that accommodate marginalised communities. Strengthening halal literacy, enabling digital transparency tools and harmonising international certification standards are vital to building a resilient and trustworthy hala*l* system. Ultimately, the halal assurance must evolve into a multidimensional framework that not only complies with *Shari'ah* law but also reflects Muslim consumers' lived realities and moral expectations across varying socioeconomic backgrounds.

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