



Halal food supply chains: A literature review of sustainable measures and future research directions

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Abstract:

Introduction. Although sustainability represents a high-profile topic in supply chain management, it remains an unexplored research area for Halal food supply chains (HFSCs). Hence, to bridge this knowledge gap, we conducted a systematic literature review to identify the measures necessary for the development of sustainable HFSCs and potential research gaps at the nexus of sustainability and Halal food literature.

Study objects and methods. We carefully analyzed forty (40) papers selected from leading, highly-ranked journals to answer the following research question: “What are the measures necessary for the development of sustainable Halal food supply chains?”

Results and discussion. The findings revealed that the improvement of Halal processes through the implementation of quality management systems, the effectiveness of Halal labeling, and the use of technology could enhance the economic performance of HFSCs. Furthermore, HFSC's sustainability efforts are strengthened by enhancing trust and transparency benefitting human resource skills development, promoting animal welfare issues, and increasing regulatory compliance. The implementation of environmental protection measures is a primary driving factor for environmental sustainability activities. Environmental sustainability could be fostered by a shift to the application of greening practices and the support of environmentalism in the Halal food industry.

Conclusion. The findings of this study provide critical managerial implications for Halal food practitioners as they can have a summary of the previous studies and thus use it as a benchmark for introducing sustainable measures in their Halal food firms.

Keywords: Halal, food industry, food supply chain, supply chain management, Islamic, sustainability

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INTRODUCTION

Halal is an Arabic word that denotes anything which is lawful, legitimate, sharia-compliant, or permitted. In the context of food, Halal reflects a set of Islamic dietary laws that are important to satisfy the demand of Muslim consumers for food quality and compliance to Islamic principles [1]. Similarly, to be fit for consumption, the entire Halal food supply chain (HFSC) should ensure that the final product is genuinely Halal at the point of the consumer purchase [2]. This implies that all materials used in the production of food should be Halal, and all machinery, utensils, tools and packaging

should not be contaminated by non-Halal elements (e.g., porcine, alcohol, dirty materials).

The integrity of the Halal food chain is crucial for the successful operations of Halal food businesses as it entails both compliance and assurance of the proper preparation, production, processing, distribution, and delivery of safe products to the final consumer. Apart from being a religious obligation, Halal food attracts non-Muslim consumers who increasingly perceive Halal-certified food as a symbol of hygiene, quality, safety, and additional health benefits [3].

Today, the Halal food industry is a large revenue market and according to PEW Research, the global

Muslim population will increase by 73% to an estimated 2.8 billion by 2050 [4]. For example, the Halal food market has amounted to USD 1.292 trillion, almost triple the size of Japan's food and beverage market [5]. The increase in the demand for Halal food is due to numerous factors including population growth, economic prosperity, globalization of the Halal food chain, as well as social and religious obligations to consume only Halal [6]. Moreover, a growing number of non-Muslims consume Halal products, due to the perception that Halal foods are safe [7].

As Muslim and non-Muslim consumers are becoming aware and knowledgeable about their food consumption, sustainability remains a growing concern in the food industry [8]. According to Abdullah *et al.*, the fast-evolving Halal food industry will face growing pressure responding to consumers' concerns [9]. Therefore, a systemic approach to address sustainability issues in the HFSC is imperative to optimize the value chain and support food preparation, processing, storage, and logistics. As such, challenges related to sustainable HFSC practices, nutrition, food safety, food authenticity and corporate social responsibility should be a high priority on the agenda of Halal food suppliers and retailers. Therefore, the purpose of this study was to investigate the necessary measures that can be taken to develop sustainable HFSCs.

This research responds to Abdullah *et al.* and Rahman *et al.*, who note that there is still a lack of research that documents the sustainable practices in the HFSC [9, 10]. Their calls have provided a justification for conducting this study. As such, we conceptualize Halal sustainability as a significant shift from today's Halal food ecosystem, where the primary goal is compliance with the Islamic dietary law, to the development of holistically sustainable HFSCs. We recognize that the transition toward sustainable HFSCs gives rise to necessary changes in the governance of how Halal foods are prepared, produced, handled, and delivered to consumers. Hence, we conducted a systematic literature review and a bibliometric analysis to identify the sustainable practices that are implementable within HFSCs.

The literature on Halal food and sustainability remains fragmented, poorly conceptualized, and a patchwork of non-coherent insights. To bridge this knowledge gap, we attempted to provide clear answers to the following research question: "*What are the measures necessary for the development of sustainable Halal food supply chains (HFSCs)?*"

The originality of this paper stems from the identification of practices that can be embraced by HFSCs to achieve sustainability. To the authors' best knowledge, this review represents the initial attempt to cover this increasingly emerging topic. Thus, providing a deeper understanding of sustainability within the context of the Halal food industry. Halal

food scholars and practitioners can gain relevant insights from this relatively unexplored area. Our academic contributions are significant and threefold. Firstly, the ultimate goal of this work was to condense current knowledge from a wide variety of sustainable practices in the HFSC transparently and thoroughly. Secondly, despite some partial attempts to uncover sustainability themes in HFSCs, they are limited to one dimension (e.g., environmental sustainability) while the other dimensions (i.e., economic and social sustainability) are ignored or barely discussed. Unlike previous studies, this study provides a comprehensive analysis of all practices transcending the three dimensions of sustainability, namely, the economic, social, and environmental dimensions. Lastly, the review investigation is useful to evaluate knowledge generation, circulation, and discourses among the Halal food scientific community. We posit that a balanced scholarly focus on sustainability from different perspectives can be insightful and valuable for identifying actions and practices that drive sustainability in HFSCs. Accordingly, this contribution is what this study primarily intends to achieve and deliver.

STUDY OBJECTS AND METHODS

The study aimed to review the existing academic literature regarding HFSCs and sustainability and to explore overlaps. A systematic literature search summarized existing knowledge on the sustainable measures applicable to the Halal food industry. The literature review procedure utilized guidelines from Malik *et al.* [11]. As such, the authors first identified the relevant search keywords for the query process. The search keywords were determined based on the central objective of the study and consisted of two string groups. The first combination of keywords included: "*sustainab * OR environ * OR eco * OR green * OR social OR societal OR ethic * OR CSR OR eco- OR efficiency OR "triple bottom line" OR TBL.*" The second combination contained the following terms: "*Halal food" OR "Halal drink" * OR "Halal meat."*"

The authors accessed Scopus and Web of Science (in December 2019) to query article titles, abstracts, and keywords. Scopus provided comprehensive coverage of peer-reviewed academic literature and is considered the largest abstract and citation database of peer-reviewed literature covering a wide range of disciplines [12]. While Scopus provides the opportunity to access high-quality, peer-reviewed data for systematic reviews, it is not a complete source [13]. For this reason, we used Web of Science to identify any additional studies not currently indexed in Scopus. The initial search was limited to peer-reviewed journal articles published in English. Consistent with Ramos-Rodríguez and Ruiz-Navarro, this procedure helps to ensure that the literature originates from academic sources, increasing the credibility in their findings [14].

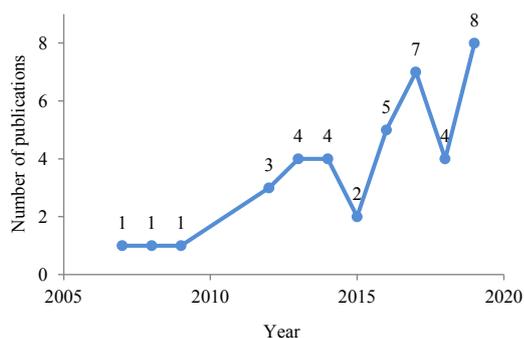


Figure 1 Time distribution of the 40 papers

Scopus returned one hundred and twenty-four (124) articles, and Web of Science returned eighty-four (84) articles. The majority of the Web of Science articles ($n = 84$) were included in the Scopus search results and removed. We applied filter criteria to retain only articles with titles, abstracts, and keywords that were relevant to the scope of the present study. This filtering procedure reduced the number of publications to sixty (60), with fifty-six (56) from Scopus and four (4) from Web of Science. After reading and evaluation of full content, forty (40) journal articles were considered relevant for the research and retrieved for the final analysis. Each of the papers was carefully examined to ensure that insights considered the overlap of sustainability practices with HFSCs. To facilitate the analysis of the selected articles, we created a database to categorize and group the topics.

RESULTS AND DISCUSSION

Distribution of papers by year. We plotted the number of articles in different periods to reveal the evolutionary trend of research interest. Figure 1 shows the yearly distribution of journal articles retained for the review. Despite the historical roots of sustainability, literature related to sustainable practices in HFSCs did not emerge until 2007. The scholarly interest in sustainability within HFSCs commenced in 2007 and grew steadily until 2015. Generally, there is an upward pattern in the number of journal articles published from 2007 on. However, from 2015 onward, the focus on sustainability within the context of the Halal food

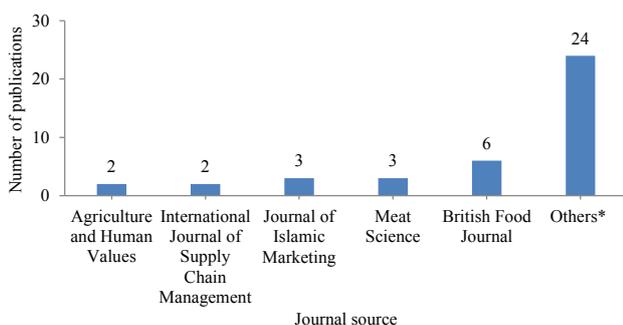


Figure 2 Journal source distribution

industry increased, resulting in eight (8) articles in 2019. We observed that twenty-six (26) out of forty (40) journal articles published between 2015–2019 reflected the nascent and growing interest of the Halal food research community into the concepts of sustainability and HFSCs.

Journal source distribution. As illustrated in Fig. 2, the selected publications were spread across twenty-nine (29) journals. Notably, the British Food Journal published six (6) articles, Meat Science published three (3), Journal of Islamic Marketing published three (3), and the International Journal of Supply Chain Management and Agriculture and Human Values published two (2) articles each. The category “others” consisted of twenty-four (24) journals with one (1) publication each.

Distribution of papers according to the research approach. Figure 3 describes the classification of the forty (40) selected studies according to the research approach applied. We applied two main research methods for categorization; theoretical and empirical. Empirical articles focused on assessing consumers’ attitudes and perceptions regarding the consumption of Halal food, evaluating the impact of adopting lean practices and quality management systems. The collection of primary data encapsulated a wide variety of methodological approaches such as surveys, case studies, content analyses, and interviews. The theoretical articles were conceptual, review-type research discussing Halal food from diverse perspectives such as marketing, production, supply chain management, and religion. The reviewed papers provided a synthesis on Halal slaughter, stunning techniques, and other issues mainly related to animal welfare. One paper used mixed methods, developing a framework and validating it with empirical data through a survey. To increase the transparency of the review process,

Table 1 summarizes all pertinent articles selected for this study and their classification according to the research methods applied.

Discussion of measures for sustainable HFSCs and future research directions. In this section, we discuss the possible measures to be taken to drive the development of sustainable HFSCs. The

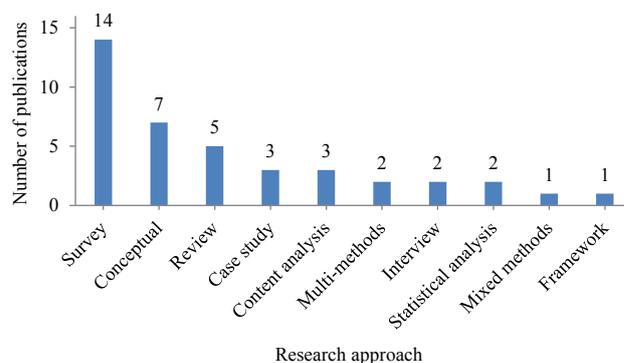


Figure 3 Distribution based on research methodologies

Table 1 Classification of publications according to research methodologies

Research approach	References
Survey	Ab Rashid and Bojei; Ashraf; Fuseini <i>et al.</i> ; Idris; Jayakrishnan <i>et al.</i> ; Kuzaiman <i>et al.</i> ; Manzouri <i>et al.</i> ; Manzouri <i>et al.</i> ; Muhamed <i>et al.</i> ; Rezai <i>et al.</i> ; Verbeke <i>et al.</i> ; Weng and Khin [15–27]
Conceptual	Bonne and Verbeke; Kabiraj <i>et al.</i> ; Mukherjee; Nasaruddin <i>et al.</i> ; Soon <i>et al.</i> ; Tieman and Hassan; White and Samuel [8, 28–33]
Review	Chandia and Soon; Fuseini <i>et al.</i> ; Nakyinsige <i>et al.</i> ; Sabow <i>et al.</i> ; Sohaib and Jamil [34–38]
Case study	Bergeaud-Blackler; de Souza <i>et al.</i> ; Lever and Miele [39–41]
Content analysis	Kamarulzaman <i>et al.</i> ; Mostafa; [42–44]
Multi-methods	Ali and Suleiman; Khan <i>et al.</i> [45, 46]
Interview	Ahmad <i>et al.</i> ; Kurth and Glasbergenand [47, 48]
Statistical analysis	Ismail; Mohd Noor <i>et al.</i> [49, 50]
Mixed methods	Abdullah <i>et al.</i> [9]
Framework	Adham <i>et al.</i> [51]

sustainability measures drew on the triple-bottom-line (TBL) framework identified from the literature and supplemented with unaddressed research gaps and recommendations for future research. The TBL framework dates back to Elkington who argues that organizations have to emphasize the importance of economic, social, and environmental performance [52]. Similarly, Carter and Rogers suggest that firms who pursue the three foundational dimensions of the TBL framework would be able to achieve better economic performance. In the context of HFSCs, the company's vision of sustainability implies that these dimensions are equally important [53].

Sustainable economic measures in HFSCs. HFSC quality management systems. Research by Kuzaiman *et al.* highlighted that Halal food producers must consistently improve their products by applying a high-quality, holistic process management system [20]. This goal can be achieved by the careful monitoring of raw materials and upgrading labor skills [50]. In Ahmad *et al.*, the authors argue that the implementation of quality management systems (QMS) could help Halal food manufacturers to reinforce trust, lower operating costs, and increase the overall profitability of the HFSC [47]. The authors further note that the design of a QMS is invaluable for continuous improvements in the Halal food company.

QMS aids in the monitoring of activities and tasks which are necessary to maintain a desired level of excellence in quality-related policy and planning, quality assurance, quality control, and quality improvement. This implies that Halal food businesses should take a QMS approach to develop more effective HFSCs, reducing the risk of product recalls and reducing the overall risk to Halal food chain integrity. Integrity in this context implies maintaining food quality during transit, especially in cold chains, ensuring food safety is maintained, eliminating the risk of cross-contamination, and protecting the authenticity of the product against the risk of counterfeit or economically motivated adulteration by bad actors along the extended Halal food chain.

Hence, while fostering quality improvements within the organization is crucially important, a Halal QMS should extend beyond the boundaries of the firm to maintain HFSC integrity of the food while in transit [47]. The lack of QMS in HFSC activities may lead to several problems and consequently, to additional internal and external costs [54]. In Manzouri *et al.*, the authors argued that the implementation of QMS may be problematic for small-size food companies due to the lack of resources [22]. Therefore, to ensure the quality of their Halal food products, these businesses need to develop specialized and customized solutions that can increase their ability to deliver safe and authentic Halal food products that meet consumers' demands and comply with applicable regulatory requirements.

Halal labeling. Halal product labeling represents a critical communication medium by which consumers can obtain knowledge about Halal food products [55, 56]. Hence, an appropriate labeling scheme can increase consumer confidence and willingness to purchase Halal products [33]. Further, the usage of an industry-standard barcode (i.e., such as the industry-standard GS1 barcodes) combined with a lot or batch number (or a QR code) on the label facilitates consumer inquiry using a mobile phone scan or a website [57]. Within the supply chain itself, product traceability using GS1 standards on packages and pallets of goods enables the tracking of Halal food to a specific supply chain actor as well as across the entire supply chain processes [23].

Future research should investigate the requirements to build an efficient and effective traceability system that can preserve the integrity of Halal food and assure adequate verification and control processes [26]. To enhance the marketability of Halal food products, stakeholders in the HFSC may be interested in restructuring their strategies to broaden their market reach, design effective branding and attractive packaging for their offerings [23]. Importantly, communicating the nutritional value of Halal food is a regulatory requirement and may enhance trustworthiness, which is the key to establishing trustful relationships in HFSCs [16].

Whenever consumers are skeptical about the authenticity of Halal food products, market research on new and creative promotion techniques (i.e., signalling) should be conducted to improve marketing effectiveness and reduce consumers' anxiety [18]. Marketers should, therefore, design Halal labels that reduce information asymmetry and increase consumers' confidence in the quality and authenticity of Halal food. As food fraud includes the false representation of a Halal certification logo on product packaging, research should focus on consumer-facing tools to assist Halal food consumers to authenticate the integrity of the Halal certification logo on food products [58–60]. Additional research could investigate and clarify the role of new policies and institutions to help Halal food producers to embrace sustainable practices to market their food to wide market segments [25]. On this latter point, the application of the United Nations Sustainable Development Goals (SDGs) for HFSCs is crucially important [61].

Technology. The use of modern information technology systems and tools is crucial to enhance the efficiency, productivity and integrity of Halal food chains [62]. For example, the integration of the Internet of Things (IoT) devices in HFSCs could revamp several Halal logistics activities and enhance the integrity of cold chain processes such as the assurance of food quality through IoT-based temperature monitoring [63]. In discussing the implication of IoT in HFSCs, Ab Rashid and Bojei argued that RFID (Radio Frequency Identification) brought benefits to HFSCs, including the improvement of Halal meat traceability, and optimizing resource utilization [15]. Drawing on this study, researchers may conduct cost-benefit analyses of investing in new technologies to enhance the operations of HFSCs. The application of IoT in the HFSC has the potential to improve the operational efficiencies of HFSCs, strengthen the coordination of food processes, provide insightful information for real-time decision-making, and enhance marketing efficiency and effectiveness. Added to those benefits, Ahmad *et al.* argue that Halal food businesses could use the Internet and social media platforms to increase their technology resilience capacity (e.g., utilizing scalable cloud-based platforms), establish their online presence, increase consumer engagement, and achieve higher product visibility online [47].

A recent study by Kamarulzaman *et al.* found that social media could play a significant role in supporting businesses to communicate their efforts at addressing Halal food market imperfections to consumers [42]. The authors further reported that social media websites could be useful for overcoming several challenges, such as the lack of knowledge of Halal food sources, food quality, and authenticity. Moreover, the efficient management of HFSC activities can also be facilitated through the adoption of business intelligence tools and big data. In this regard, Ahmad *et al.* submitted that big data could

enhance the capability of HFSCs to manage several problems associated with supply chain documentation, logistics packaging, as well as Halal and other critical business tasks [47]. In another study, Jayakrishnan *et al.* argued that the use of big data and business intelligence techniques could help HFSCs optimize their organizational performance through increasing the effectiveness of decision-making processes and knowledge creation [19]. Therefore, scholars may be interested in examining the factors and barriers to adopting these technologies HFSCs.

Sustainable social measures in HFSCs. Trust and transparency. In order to retain competitiveness, Halal food companies should enhance transparency and trust in HFSC processes and activities. A lack of trust can have adverse effects on HFSCs performance and consumers will not buy Halal food products or engage with Halal food suppliers [16]. Halal food producers have to enhance the level of trust in their supply chains and products because trust is a key determinant in brand image (brand trust) and better operational performance [28]. Trust could be established by enhancing information transparency and by disclosure more timely, understandable, and reliable information relating to HFSC processes [15].

Halal food companies have to recognize the value of trust and transparency in securing the authenticity of Halal foods. The provision of food production information and a trustworthy Halal quality signal (such as a Halal certification logo) can be beneficial for consumers and a key driver to seek additional reassurance [8, 33]. From a consumer perspective, a participatory approach involving consumers in the cooperation and circulation of reliable information regarding Halal food status could ensure higher Halal food integrity [15].

Soon *et al.* argued that the key to maintaining Halal integrity in international trade is transparency, and consequently HFSC actors, policymakers, regulators, Halal certification authorities, and research institutions should devote concerted effort to create a more holistically integrated Halal food ecosystem [31]. Furthermore, there is a necessity to develop trustworthy Halal-certified products as they may foster an increased sense of consumer trust and confidence in food products [15]. Therefore, research on how to increase trust and what levels of transparency to consider is necessary to assure that Halal food products are properly prepared, handled, processed, and delivered to final consumers.

Human resource development. The development of human resources constitutes a strategic capability to sustain the competitive advantage of HFSCs. The empowerment of workers operating in the Halal food industry is valuable for increasing the efficiency of HFSC operations [50]. The employees should possess full knowledge of Halal food guidelines and practice the concept of hygiene allowed by Islamic dietary law [15].

This means that it is critical to abide by Halal requirements throughout the HFSC, from slaughtering, production, and distribution to the delivery of Halal food products to consumers.

The support of the Halal workforce can be determined by the utilization of new technologies, the continuous upgrade of labor skills, and the establishment of training programs sustained by the related parties such as the regulatory bodies, Halal food organizations, and Halal business incubators [49]. Idris argues that to reap the benefits of new technologies in HFSCs, organizations should focus on implementing the necessary infrastructure and develop a highly skilled and proficient workforce capable of responding to consumers' needs [18].

To adapt to lean manufacturing principles and the introduction of new technologies, the Halal workforce should be well informed about the goal of HFSCs and involved in lean supply chain implementation, decision-making, and value creation processes [21, 49]. This approach could reinforce Halal assurance practices and significantly increase organizational performance [64]. The lack of employee motivation can have adverse effects on HFSCs. Due to this issue, Manzouri *et al.* attributed the lack of adoption of QMS in Halal food companies to the weaknesses of human resources skills and knowledge [21]. As a result, scholars could investigate how Halal food companies can motivate their employees and improve their capabilities by adopting a food safety culture extending to the dynamics facing HFSCs such as globalization, adoption of new technologies, and the increasing need to develop professional skills.

Animal welfare. HFSC actors should include ethical principles, particularly in animal testing activities and quality inspections [30]. The livestock industry should strive to account for all ethical principles related to food animals from farms to the slaughterhouse. At the farm level, HFSC actors should allocate a unique identification number to every animal. Farmers should capture and record all necessary information relating to the health conditions and veterinary interventions with their animals, including the supply chain details of feed and nutrients used to raise the livestock.

New food industry directives should convert meat-based ingredients to plant-based ingredients and additives, replace porcine by bovine sources, and support plant-based animal foods [32]. In doing so, Halal food companies could address the growing concerns of segments of consumers who care about the provenance (i.e., origin) of the food that animals are fed and the history of the farm upon which livestock were raised or grazed [33]. Moreover, care should be taken to ensure proper slaughter processes. Specialized staff should be placed in charge of overseeing animal welfare during the slaughter process [36]. Sabow *et al.* argue that stunning using electricity should be carried out at high

voltage because of its ability to keep the animal alive in compliance with the fundamental requirements of Halal slaughtering [37].

For example, Fuseini *et al.* indicate that the majority of scholars (> 95%) agreed that if pre-slaughter stunning does not result in the death of the animal, the meat would be Halal [17]. HFSC actors should maintain an appropriate range of voltage, ensure the integrity of the equipment, and the availability of skilled operators in order to comply with the Halal rules for animal slaughter. Therefore, a unified global Halal standard is imperative to incorporate animal welfare-friendly slaughter practices and measures in HFSCs [17]. This would help to provide more transparency on the slaughter process and enable HFSC stakeholders to make more informed decisions regarding stunning practices.

Regulatory support. Several regulatory bodies frame Halal certification standards across Muslim majority countries with the United Arab Emirates perceived as a leading authority [42, 65]. In order to ensure a cohesive and coherent global approach to Halal regulations, intervention efforts are needed to ensure enforcement and strict compliance of HFSC actors. The success of the Halal industry is highly dependent on governments to regulate HFSCs through Halal regulations, food safety standards, enforcement, and incentives that could accelerate the growth and development of HFSCs [15].

More robust government support should be in place through the encouragement of business incubators who provide training to entrepreneurs in the Halal food industry, advice and external consulting, and assistance in meeting the requirements of the Halal food market. For example, KIMAR is a business incubator in Malaysia that works to improve the awareness of potential entrepreneurs and their access to finance, training, and advice through many platforms [51]. The role of this incubator also involves the building of firms' capabilities to establish networks and partnerships of knowledge sharing and collaboration in the Halal sector.

The importance of regulatory support is highlighted in the study of Kurth and Glasbergen, who emphasized the need for improvement in areas related to stakeholder engagement, transparency, accessibility, impartiality, and efficiency [48]. The value of a supportive regulatory environment can prevent malicious actors from compromising the Halal integrity of the food chain [29]. Herein, recall that the Halal principle entails that all stakeholders in HFSCs must act based on trade fairness, ethical business practices, honesty, and good conduct. By the same token, the commitment of all HFSC stakeholders and the heavy involvement from the concerned authorities should be invested to improve the quality of Halal food products as the lack of regulations, standards, and enforcement could result in the failure of HFSCs, the spread of fraudulent practices, and unethical conducts [30, 42].

Thus, monitoring and enforcement of Halal standards and regulations have to be consistently evaluated so that consumers' confidence and trust in Halal food can be enhanced [24]. As supported by Soon *et al.*, countries that commit to implementing standardized Halal practices can increase efficiency and boost Halal food trade [31]. Hence, future research should be directed toward discussing the opportunities and challenges of Halal food standardization in the HFSC.

Sustainable environmental measures in HFSCs. Implementation of greening practices. The food industry is recognized as one of the contributors to detrimental environmental impacts, incurring a large amount of food waste and creating a high carbon footprint [9]. Therefore, the sustainable functioning of HFSCs hinges on their contribution to environmental protection and the proper consideration of the potential environmental risks threatening the food ecosystem. One way to reinforce environmental sustainability in HFSCs is to implement greening practices.

According to Weng and Khin, the application of greening practices in HFSCs could prevent health hazards to humans and animals [27]. The authors argue that greening practices should protect endangered flora and species. Further, a significant reduction of waste is required in food processing and packaging. Of crucial importance is to protect animal welfare and ensure food quality through the efficient use of resources. Moreover, engagement in greening activities is beneficial for HFSC actors as the World Business Council for Sustainable Development argued that companies incorporating greening practice were able to achieve higher financial performance, lower production costs, improve product quality, increase market share, increase environmental performance, and build long-term relationships with exchange partners [9].

If Halal guidelines are aligned with supply greening practices, HFSCs can lower production costs, reduce negative environmental impacts, and improve the overall performance of the Halal food company. Aside from providing sufficient assurance of Halal food integrity, Halal transportation should be optimized in a way that reduces "food miles" by sourcing more products from local suppliers [63]. The logic behind this approach is attributed to the fact that products sourced from afar it can be argued that bulk transportation is cheaper in products sourced from afar result in more emissions and vulnerabilities.

Nevertheless, this scenario is invalidated if distant HFSC suppliers provide green products to customers or embrace greening practices, including the use of production facilities that are less energy-demanding and with low carbon emissions. For example, de Souza *et al.* illustrate that Saudi Arabia pursues an import strategy that aims to source green feed for the production of Halal food [40]. Therefore, this opens new opportunities

for scholars to explore the trade-offs between sourcing locally or from geographically disperse suppliers.

Environmental protection. As segments of Halal consumers are becoming more oriented toward the purchase of eco-friendly products, HFSCs should adapt their operations. Rezai *et al.* argued that sustainable development in agriculture and the food industry is a determinant for a productive Halal ecosystem [25]. To maintain environmentally sustainable HFSCs, an improvement in agriculture must occur through soil conservation, an increase of arable land, efficient water use, and reduction of chemicals and fertilizer consumption [9].

Besides, the mounting public awareness of the necessity to protect the environment should motivate HFSCs to introduce new business practices that can respond to stakeholders' pressures and demands for reduced ecological damages and better environmental measures. In this regard, Rezai *et al.* found that the majority of consumers considered Halal food production a better reflection and driver for the support of sustainable farming activities [25]. To create more value for consumers, HFSC stakeholders should be eco-sensitive in their operations, decisions, and policies with regards to sourcing, manufacturing, logistics, and transportation.

Similarly, Halal regulatory bodies need to provide incentives for companies to adopt the best practices and to place the environmental responsibility at the heart of business strategy and mission. Research in this area should focus on the role of Halal organizations in institutionalizing the measures of environmental protection throughout the entire HFSC. Consistent with Abdullah *et al.*, an integrative and inclusive approach for environmental sustainability should be applied in the Halal food industry to reduce food waste, encourage sustainable food processes, reduce the environmental impacts, and cater to the needs of all stakeholders in the Halal food industry [9].

CONCLUSION

The purpose of this study was to explore the sustainable measures that could be employed in the Halal food industry. Through the conduction of a systematic literature review, forty (40) studies were thoroughly analyzed using content analysis and a bibliometric method. The results presented in this study are useful in offering valuable insights and a holistic view of the transition toward the development of HFSCs.

The review focused on identifying the trends in sustainability research specific to HFSCs. The trends revealed that the Halal food sector is an emerging research area with an increasing number of publications over in recent years. Moreover, the use of empirical research methods was dominant. From the analyzed literature, it has been demonstrated that the economic and social dimensions of sustainability have attracted

more attention than the environmental dimension. HFSCs necessitate radical changes to be sustainable.

To this end, this study represents a unique opportunity to contribute to the Halal food research in several aspects. Firstly, it draws on the TBL framework to comprehensively synthesize the necessary measures for the development of sustainable HFSCs. Secondly, the focus on improving Halal food processes through the implementation of holistic quality management systems, the establishment of adequate operating infrastructure, and the development of an interoperable supply chain can enhance the competitiveness of Halal food firms. The use of effective labeling practices could support Halal food consumer purchase decisions. Halal food firms can capitalize on labeling to signal the sustainability of their products, communicate the nutritional value of Halal food, and inform consumers of the truthfulness of food attributes.

The adoption of new technologies, such as the Internet of Things, social media, big data analytics, and business intelligence tools, can enhance the operational performance of HFSCs. These technologies have the potential to be the gateway toward the fulfillment of economic sustainability by enhancing the integration of Halal food processes, optimizing production operations, facilitating traceability, and ameliorating the marketability of Halal products. In order to maximize the benefits of social sustainability, HFSC stakeholders have to reinforce trust and transparency, place a priority on the development of quality human resources, respond to animal welfare concerns, and acquire regulatory

support. From the environmental perspective, the implementation of greening and environmental protection measures is imperative to encourage the delivery of environmentally sustainable Halal food.

The findings of this study provide critical managerial implications for Halal food practitioners as they can have a summary of the previous studies and use it as a benchmark for introducing sustainable measures in their Halal food firms. Similarly, Halal food researchers may be inspired to carry out further studies as they have a clear idea of the existing gaps in the extant literature as a starting point of their future research projects.

Lastly, we would like to acknowledge the limitations of our review. Although we queried two major academic databases, we cannot claim that we covered all published works falling in the scope of our study. The literature collection process was guided by a set of keywords, which provide us with a certain level of confidence that we have synthesized an extensive knowledge base on the overlaps between sustainability and HFSCs and the existing gaps in the literature.

CONTRIBUTION

All the authors contributed equally to the study and bear equal responsibility for information published in this article.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this article.

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