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Review article

Integrating sustainable practices in chili processing enterprises: A literature review

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ABSTRACT

This study explores the integration of sustainability principles in Micro, Small, and Medium Enterprises (MSMEs), focusing on chili processing enterprises in Garut Regency. Using a systematic literature review, it analyzes 60 scholarly articles to provide a comprehensive overview of strategies for embedding economic, environmental, and social aspects into MSME operations. The findings emphasize the crucial role of clearly defined responsibilities and collaboration among various stakeholders, including business managers, government agencies, educational institutions, local farmers, and the broader community. The study highlights how these stakeholders can work together to foster a sustainable business environment that enhances profitability while promoting environmental conservation and social welfare. By offering a conceptual framework, this research addresses a significant gap in the literature on sustainable practices in the agricultural processing sector, providing practical insights and recommendations for MSMEs. This holistic approach ensures that these enterprises achieve long-term sustainability while meeting the economic, environmental, and social goals essential for their growth and competitiveness.

1. Introduction

The implementation of sustainability principles in Micro, Small, and Medium Enterprises (MSMEs) is critical, especially in developing economies where these enterprises support local economies and provide significant employment [1], [2], [3]. However, challenges such as limited resources, insufficient knowledge, and restricted access to sustainable technologies often hinder MSMEs from fully adopting sustainable practices [2], [3], [4], [5]. In Garut Regency, a chili processing MSME center was established to enhance the value of chili products, stabilize prices, and create jobs . These findings emerged from a preliminary study conducted through observations and interviews with the Department of Industry and Trade of Garut Regency, highlighting significant issues such as overcapacity, underutilized machinery, and inefficient raw material management, which have led to high operational costs, increased waste, and environmental degradation. Additionally, inadequate training restricts the workforce's ability to effectively utilize complex machinery, limiting the project's overall impact.

There is a notable gap in existing research concerning the comprehensive integration of sustainability principles in MSMEs, particularly in the context of agricultural processing industries like chili processing in Garut Regency. While various studies have addressed individual aspects of sustainability, such as economic viability, environmental impact, or social welfare, there has been no holistic approach that combines these elements within the MSME sector, especially in the regional context of Indonesia [6], [7], [8]. This research seeks to fill this gap by conducting a Systematic Literature Review on the comprehensive application of sustainability principles in MSMEs, with a specific focus on production, supply chain management, and community empowerment. The study aims to identify effective strategies for integrating economic, environmental, and social aspects of sustainability holistically. The lack of prior comprehensive research in this area underscores the importance of this study, as it will provide crucial insights and recommendations for improving the planning and implementation of sustainable practices in similar programs. This research is vital for ensuring

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the optimal, profitable, and environmentally friendly peration of MSMEs, while also enhancing the well-being of local communities

2. Material and method

This chapter outlines the systematic literature review (SLR) conducted to explore sustainability practices in MSMEs, focusing on chili processing enterprises in Garut Regency. The review examines 60 peer-reviewed articles (2019–2024) sourced from Google Scholar, Scopus, and Web of Science, supported by an additional 30 articles to strengthen the background and research findings. Inclusion criteria target studies addressing economic, environmental, and social sustainability aspects in MSMEs, particularly in agricultural processing, while exclusion criteria omit articles not in English or Indonesian, those unrelated to MSMEs, or published before 2019. Quality assessment ensures methodological rigor and relevance, with findings categorized to highlight management practices, technology use, policy influence, and community involvement. This synthesis provides actionable insights for enhancing sustainability in MSMEs, offering recommendations for policy-making and future research.

3. Results and discussions

This review synthesizes findings from 60 articles on sustainability in MSMEs, focusing on balancing profitability, environmental conservation, and social well-being. The research highlights that clear role definitions and effective collaboration among stakeholders, including management, government, Chili Processing Enterprises, educational institutions, farmers, and the local community, are crucial for successful implementation of sustainability practices [9], [10], [11]. Each stakeholder has distinct responsibilities that, when optimized, create a synergistic effort towards a sustainable business ecosystem [12], [13], [14]. This integrated approach ensures that economic, environmental, and social objectives are met, promoting a holistic sustainability strategy in the chili processing SMEs center in Garut.

3.1. Litetarure mapping

This research positions itself within the broader context of sustainability issues, focusing on the integration of economic, social, and environmental aspects. The novelty of this study lies in the emphasis on stakeholder collaboration, highlighting the critical role that stakeholders play in bridging education, policy, agricultural management, technology, and MSME development. By fostering a collaborative approach, the research proposes an integration model that not only enhances welfare and competitiveness but also ensures environmental sustainability. Unlike non-integrated models, which often fall short in addressing long-term sustainability challenges, this research underscores the importance of stakeholder involvement as a key driver for successful and sustainable outcomes in the development of MSMEs and agricultural management in Indonesia.

3.2. Litetarure review

To successfully implement a holistic sustainability strategy at the chili processing Small and Medium Enterprises (SMEs) center in Garut Regency, it is crucial to clearly define the roles and responsibilities of each stakeholder involved [15], [16], [17]. The sustainability of these enterprises depends on the effective collaboration and coordination between management, government authorities, chili processing enterprises, educational institutions, farmers, and the local community [18]. Each stakeholder contributes distinct resources, expertise, and perspectives that are essential for achieving a balanced approach to sustainability, encompassing economic viability, environmental protection, and social well-being [13], [19], [20].

Management within chili processing enterprises plays a critical role in integrating sustainable practices into business operations. This involves adopting environmentally friendly processes, ensuring long-term economic growth, and addressing social responsibilities [21]. Meanwhile, government authorities provide the necessary regulatory framework, financial incentives, and support systems to ensure businesses can thrive while adhering to sustainability standards [22]. By enforcing environmental regulations, offering tax incentives, and providing access to funding, the government ensures that enterprises operate in a manner that protects the local ecosystem while promoting responsible business practices. Furthermore, educational institutions contribute significantly to sustainability by conducting research, offering training programs, and developing curricula focused on sustainable practices [23]. These institutions bridge the gap between theoretical knowledge and practical application, ensuring that the workforce is well-equipped to support the sustainability goals of the industry.

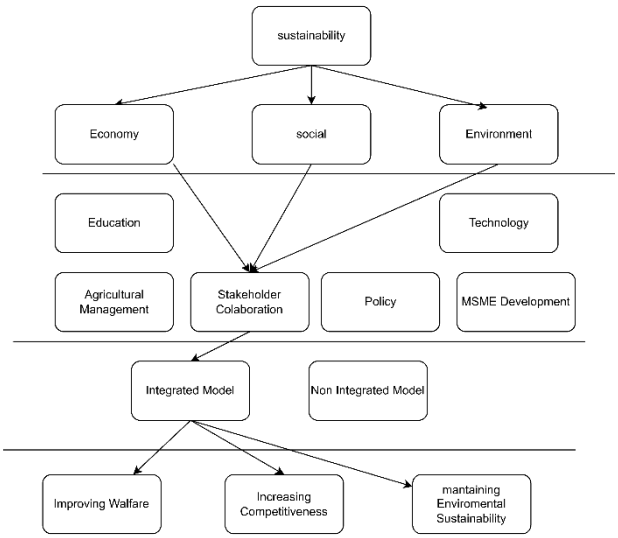

Figure 1. Litetarure mapping

A crucial aspect of sustainability is the active participation of farmers and the local community. Farmers, as primary raw material suppliers, must adopt sustainable agricultural practices that enhance productivity while preserving the environment [24]. Their role ensures a stable supply of high-quality raw materials for chili processing enterprises. The local community, on the other hand, plays a supporting role by engaging in and benefiting from sustainability initiatives, which fosters social equity and shared economic growth [25]. This collaboration strengthens the integration of sustainability within the region's economic and social framework.

Sustainability strategies within the chili processing industry include conducting audits, providing training, and raising awareness to ensure businesses comply with environmental and social standards [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [47], [49], [50], [52], [53], [54], [55], [56], [57], [58], [74]. Moreover, the adoption of eco-friendly technologies, waste management strategies, and research on sustainable methods minimizes environmental impact [62], [66], [75], [76], [77], [78], [79], [80], [81]. These efforts highlight the necessity of integrating education into industrial practices, ensuring that sustainability principles are effectively implemented and widely adopted.

Beyond the role of education, government intervention remains essential in maintaining sustainable supply chains for the chili processing industry. Regulations and incentives help enterprises operate responsibly, mitigating negative environmental and social consequences [46], [48], [24], [59], [69], [72]. Additionally, chili processing enterprises are encouraged to promote sustainable products, obtain certifications, and educate consumers on sustainability benefits [50], [57], [38], [40], [44], [68], [71], [70], [82]. These efforts not only enhance market competitiveness but also contribute to a more environmentally conscious consumer base, driving long-term sustainability in the industry [36], [37], [39], [43].

Furthermore, collaboration between the agricultural sector and educational institutions fosters the adoption of sustainable farming practices and research initiatives. Farmers receive training in eco-friendly agricultural techniques and access to cutting-edge research on sustainability [71], [24], [51], [60], [61], [63], [64], [67], [71], [73]. This approach ensures the implementation of efficient farming methods while maintaining ecological balance, thus reinforcing the region's sustainability framework. Ultimately, the synergy between education, industry, and government creates a robust system that supports economic growth, environmental conservation, and social well-being. By clearly defining stakeholder roles and fostering close collaboration, the chili processing SMEs in Garut Regency can achieve long-term profitability while prioritizing sustainability, ultimately contributing to the overall prosperity of the region.

3.3. *Analysis of sustainability implementation in Garut Regency*

The primary challenges in implementing sustainability in chili processing SMEs in Garut Regency include financial limitations, low awareness, unstable supply chains, and regulatory complexities [24], [25], [26]. SMEs struggle to access funding for sustainable investments, while limited knowledge among business owners slows the adoption of eco-friendly practices. Farmers face inconsistent production due to climate change and resource constraints, affecting supply chain stability [27]. Additionally, navigating sustainability regulations and certifications remains a challenge for many SMEs [46], [48].

To overcome these challenges, SMEs should receive financial incentives, capacity-building programs, and supply chain support [24], [50], [59]. Expanding access to subsidies, low-interest loans, and government grants can help businesses invest in sustainability. Collaboration between educational institutions and SMEs can enhance training and research on sustainable practices [25]. Strengthening relationships with farmers through contract farming and incentive programs will ensure a stable and sustainable raw material supply [26], [71].

The sustainability initiatives in SMEs should align with Indonesia's Green Industry Certification Program and Sustainable Development Goals (SDGs) [19], [72]. Government support includes subsidies for organic farming, tax incentives, and regulatory frameworks to encourage sustainability. Strengthening local government involvement in funding, enforcement, and industry collaboration will provide SMEs with a more structured path toward sustainable operations [26].

Existing research on sustainability in chili processing SMEs primarily focuses on economic and environmental aspects, while social sustainability remains underexplored [13], [20]. Studies also rely heavily on qualitative methods, limiting generalizability [17]. Furthermore, long-term impacts of sustainability policies on SMEs are insufficiently studied, requiring more longitudinal research to assess sustainability performance over time [18].

Future studies should focus on developing sustainability performance metrics, integrating digital technology, and conducting comparative policy evaluations [16], [62]. Research on blockchain for supply chain transparency, AI for process optimization, and IoT for waste management can enhance sustainability adoption [62]. Comparative studies across regions will help identify the best practices, while longitudinal research can measure the long-term impact of sustainability policies on SMEs [24], [72].

3.4. *Purposed model*

The diagram illustrates the specific roles and responsibilities of various stakeholders including government, educational institutions, farmers, and chili processing enterprisesin fostering a sustainable

business ecosystem, while also providing practical insights for effective implementation. The government is responsible for creating supportive policies, offering targeted assistance to farmers, and ensuring compliance through evaluations and audits. Educational institutions contribute by delivering training programs, raising awareness, and imparting knowledge on sustainable practices to all stakeholders. Farmers are guided to adopt eco-friendly agricultural techniques, enhancing productivity and environmental stewardship. Chili processing enterprises focus on implementing sustainable business processes, such as utilizing environmentally friendly technologies and adhering to triple bottom line principles. Collaborative efforts among these stakeholders, supported by practical, actionable insights, are critical to achieving a balanced integration of economic, environmental, and social objectives in the chili processing industry [83], [84], [85].

4. Conclusions

The research concludes with the development of a comprehensive conceptual framework for integrating sustainability principles in MSMEs, particularly in chili processing enterprises in Garut Regency. This framework underscores the importance of collaboration among diverse stakeholders, including government agencies, educational institutions, farmers, enterprises, and the local community, with clearly defined roles for each. By aligning economic, environmental, and social goals, the framework offers practical insights and actionable recommendations for MSMEs to enhance profitability, promote environmental stewardship, and support social welfare. This holistic approach serves as a valuable guide for policymakers and practitioners in fostering sustainable and competitive business ecosystems in the agricultural processing sector.

Declaration statement

Anung Andi Hidayatullah: Conceptualization, Methodology, Writing-Original Draft. Anggun Nindy Fatliana: Collecting data. Ani Umyati: Writing-Review & Editing.

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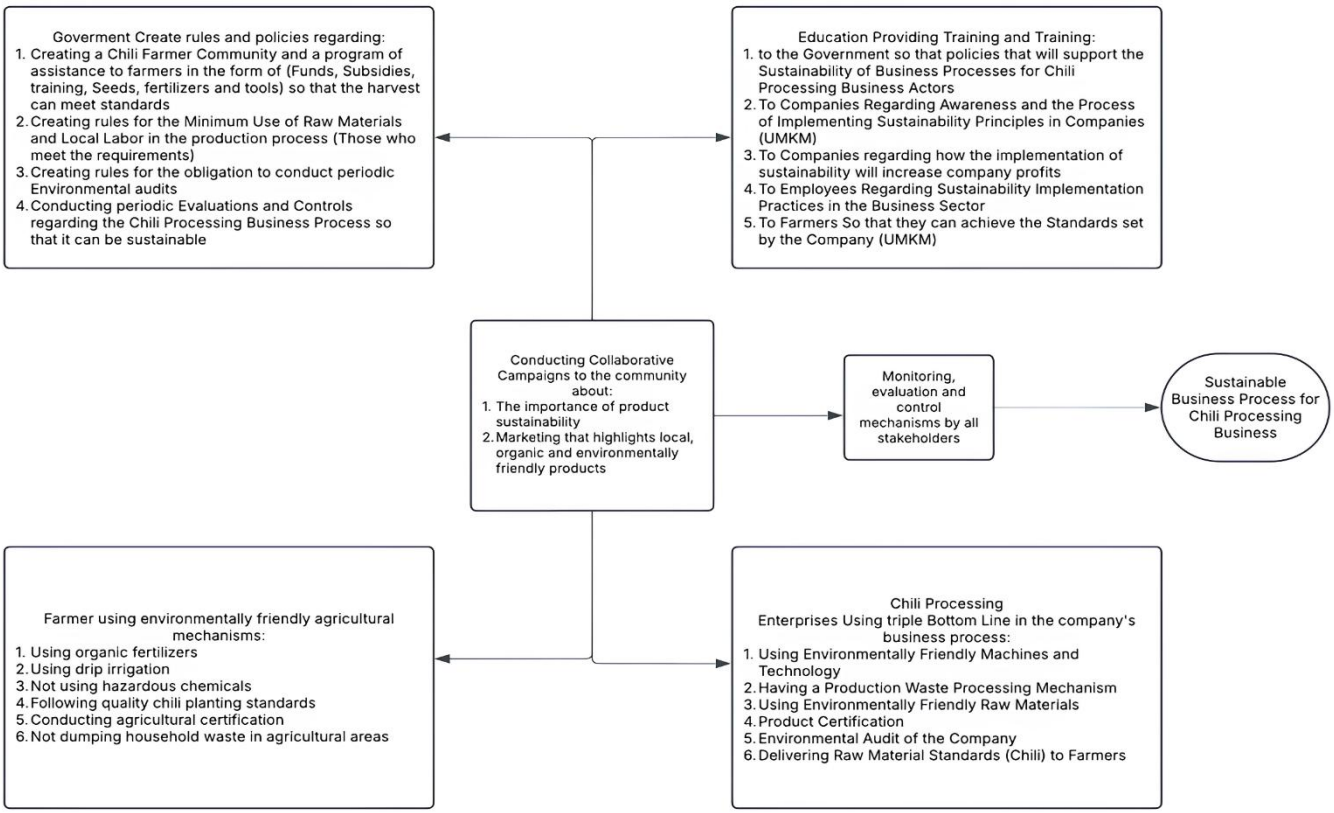

Figure 2. Proposed model

Disclosure statement

The author declares that this manuscript is free from conflict of interest and is processed by applicable journal provisions and policies to avoid deviations from publication ethics in various forms.

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

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Generative AI and AI-assisted tools were used to enhance the language and readability of this manuscript. The authors have reviewed and revised all AI-generated content to ensure its accuracy and alignment with the research. The authors remain fully responsible for the work's scientific content, conclusions, and integrity, and disclose the use of AI to ensure transparency and adherence to publisher guidelines.

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