

Digital-Based Transformation of Local Food MSMEs and Green Entrepreneurship to Support the Free Nutritious Meal Program

Lutfiyanto¹, Akh. Fawaid²

¹Department of Islamic Economic, STIE Bakti Bangsa, Pamekasan, East Java, Indonesia

²Department of Islamic Economic, STIE Bakti Bangsa, Pamekasan, East Java, Indonesia

¹lutfiyanto@stieba.ac.id, ²fawaid@stieba.ac.id

Abstract

The provision of free nutritious food is a strategic effort to improve food security and community welfare. However, challenges related to food accessibility, distribution efficiency, and production sustainability remain significant obstacles. Digitalization and green entrepreneurship offer promising solutions to strengthen local food-based Micro, Small, and Medium Enterprises (MSMEs) in supporting sustainable nutritious food programs. This study aims to analyze the role of digitalization and green entrepreneurship in enhancing the capacity of local food MSMEs to provide free nutritious food. The study focuses on the adoption of digital technologies, such as e-commerce and digital marketing, to improve operational efficiency and market reach, as well as the implementation of environmentally friendly business practices through the use of local resources and sustainable production processes. A descriptive qualitative approach was employed through literature review, interviews, and observations of food MSMEs implementing digital and sustainable business practices. The findings are expected to identify opportunities and challenges in integrating digitalization and green entrepreneurship, formulate a sustainable business model for food MSMEs, and provide policy recommendations to support the implementation of free nutritious food programs. This study contributes to the development of inclusive and sustainable local food systems while strengthening the role of MSMEs in community nutrition programs.

Keywords: Digitalization, Green Entrepreneurship, Food MSMEs, Food Security.

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INTRODUCTION

Food security remains one of the most critical challenges in achieving sustainable development and improving community welfare. The availability of affordable and nutritious food is essential for enhancing public health, reducing poverty, and supporting economic growth. In Indonesia, efforts to strengthen food security have become increasingly important through various government initiatives, including the Free Nutritious Meal Program (Program Makan Bergizi Gratis), which aims to improve nutritional intake while stimulating local economic development. However, the implementation of such programs continues to face challenges related to food accessibility, supply chain efficiency, production sustainability, and the ability of local producers to meet increasing demand. Digitalization and innovation throughout the food supply chain have been recognized as strategic instruments for strengthening sustainable food security and improving the efficiency of food production, processing, and distribution systems (Rejeb et al., 2021).

Micro, Small, and Medium Enterprises (MSMEs) in the food sector play a strategic role in supporting local food systems and ensuring the availability of nutritious food for communities (Nordhagen et al., 2021). Beyond their contribution to employment and regional economic growth, food MSMEs function as key actors in connecting local agricultural resources with consumer needs. Nevertheless, many MSMEs continue to encounter limitations in market access, production capacity, technological capability, and business competitiveness (Prasanna et al., 2019). These constraints reduce their ability to expand operations and participate effectively in large-scale food provision programs. Consequently, strengthening MSME capacity has become an important agenda in achieving both food security and sustainable economic development.

The rapid development of digital technology presents substantial opportunities for overcoming these challenges. Digitalization enables MSMEs to improve operational efficiency, optimize supply chain management, expand market reach, and strengthen customer engagement through digital platforms (Chanchaichujit et al., 2023). Technologies such as e-commerce, digital marketing, social media, digital payment systems, and data-driven business management have transformed the way businesses operate and interact with consumers. Previous studies suggest that digital transformation contributes to greater organizational agility, improved productivity, and stronger business resilience in increasingly dynamic market environments (Mangalaraj et al., 2023). Furthermore, digitalization supports the modernization of food supply chains, enabling



greater transparency, efficiency, and sustainability throughout the production and distribution process (Dong et al., 2023).

In addition to digital transformation, environmental sustainability has emerged as a major concern for businesses and policymakers worldwide. The concept of green entrepreneurship offers an innovative approach that integrates economic growth with environmental responsibility and social value creation (Ahmed et al., 2023). Green entrepreneurship emphasizes environmentally friendly production processes, efficient resource utilization, waste reduction, energy conservation, and the use of local raw materials (Makhloufi et al., 2022). These practices not only contribute to environmental preservation but also create competitive advantages by responding to growing consumer awareness regarding sustainable products. Green entrepreneurship has been identified as a catalyst for sustainable development, business innovation, and long-term organizational performance (Mondal et al., 2025).

The integration of digitalization and green entrepreneurship offers significant potential for strengthening the competitiveness and sustainability of food MSMEs (Fawaid et al., 2026). Digital technologies facilitate the promotion and distribution of environmentally friendly products, improve resource management, and support data-driven decision-making (Malik, 2024). At the same time, green entrepreneurship enhances business sustainability through environmentally responsible practices and innovative value creation. Recent studies indicate that digitalization positively influences the implementation of green entrepreneurship and that both factors contribute significantly to improving MSME performance, competitiveness, and business value. The synergy between these approaches provides a promising pathway for developing sustainable food business models capable of addressing economic, environmental, and social challenges simultaneously (Hariram et al., 2023).

Despite the growing body of literature on digital transformation and green entrepreneurship, limited studies have specifically examined their combined role in supporting local food MSMEs to provide nutritious food and contribute to food security programs (Al Halbusi et al., 2025). Most previous studies have focused on business performance, environmental outcomes, or digital adoption separately, leaving a gap in understanding how these approaches can be integrated to strengthen sustainable food systems and support food security initiatives. Therefore, further research is needed to develop a comprehensive understanding of how digitalization and green entrepreneurship can collectively enhance the capacity of food MSMEs while contributing to broader societal goals.

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Based on these considerations, this study aims to analyze the implications of digitalization in improving the efficiency, productivity, and market reach of local food MSMEs, identify the challenges faced in adopting digital technologies and green entrepreneurship practices, and examine how the integration of these approaches can create sustainable business models that support the provision of nutritious food, strengthen national food security, improve MSME competitiveness, and promote environmentally sustainable economic development. The findings are expected to provide practical and policy recommendations for governments, MSME actors, and other stakeholders in developing a resilient, inclusive, and sustainable local food ecosystem capable of supporting long-term food security objectives.

RESEARCH METHODOLOGY

This study employed a descriptive qualitative approach to explore the role of digitalization and green entrepreneurship in strengthening local food-based Micro, Small, and Medium Enterprises (MSMEs) in supporting nutritious food provision and food security programs. A qualitative approach was considered appropriate because the study aimed to gain an in-depth understanding of the experiences, perceptions, challenges, and strategies of MSME actors in adopting digital technologies and sustainable business practices within their real-life contexts (Patton, 2015).

The research integrated three main methods of data collection, namely literature review, in-depth interviews, and field observations. The study began with a comprehensive review of relevant literature on digital transformation, green entrepreneurship, MSME development, sustainable business models, and food security. This stage was intended to establish the theoretical foundation, identify research gaps, and develop the conceptual framework guiding the study (Creswell & Poth, 2016).

Primary data were collected through semi-structured in-depth interviews with key informants consisting of local food MSME owners and managers, government representatives involved in MSME and food security programs, community leaders, and other relevant stakeholders. The use of semi-structured interviews allowed flexibility for participants to share their experiences and perspectives while enabling the researcher to explore emerging issues relevant to the study objectives (Patton, 2015). Informants were selected using purposive sampling based on their knowledge, experience, and involvement in digitalization initiatives, sustainable business practices, and local food production activities.



In addition to interviews, field observations were conducted to obtain contextual information regarding production processes, marketing activities, digital technology utilization, environmental management practices, and interactions among stakeholders. Observations enabled the researcher to compare participants' statements with actual practices and provided a deeper understanding of the operational realities faced by food MSMEs (Sugiyono, 2013).

Data analysis was conducted following the interactive model proposed by Miles et al. (2014), which consists of data condensation, data display, and conclusion drawing/verification. Interview recordings and field notes were transcribed and organized systematically. The researcher then coded the data to identify recurring themes, patterns, and categories related to digitalization, green entrepreneurship, business sustainability, and food security. The findings were subsequently interpreted and linked to the theoretical perspectives and previous studies identified in the literature review.

To ensure the trustworthiness and credibility of the findings, this study employed triangulation techniques involving multiple data sources, methods, and periods of observation. Data obtained from interviews, observations, and literature were compared and cross-checked to enhance consistency and validity. Member checking was also conducted by confirming selected findings with participants to ensure that the interpretations accurately reflected their perspectives and experiences (Lincoln & Guba, 1988).

The results of the study were presented descriptively to provide a comprehensive understanding of how digitalization and green entrepreneurship can be integrated to strengthen local food MSMEs, support nutritious food provision, and contribute to sustainable food security development. The entire research process was documented systematically to maintain transparency, rigor, and reliability throughout the study.

Research Findings

The findings of this study reveal that local food-based Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in supporting food security and community welfare, particularly within the framework of Indonesia's Free Nutritious Meal Program (Program Makan Bergizi Gratis/MBG). The increasing demand for affordable and nutritious food has created new opportunities for local food MSMEs to expand their market reach and strengthen their contribution to regional economic development. However, the ability of MSMEs to respond effectively to these opportunities is strongly



influenced by their capacity to adopt digital technologies and implement sustainable business practices.

The study found that digitalization has become one of the most important drivers of MSME transformation. Many MSME owners acknowledged that digital platforms have enabled them to reach wider markets beyond their local communities. The utilization of social media platforms, online marketplaces, and digital payment systems has facilitated communication with customers, improved transaction efficiency, and increased business visibility. Several participants reported that digital marketing strategies helped them attract new customer segments and maintain business continuity in an increasingly competitive environment.

Furthermore, digitalization was found to improve operational efficiency across various business activities. The use of digital tools in inventory management, customer relationship management, and financial administration allowed MSMEs to reduce operational costs and improve decision-making processes. Digital technologies also contributed to greater transparency in supply chain management by enabling entrepreneurs to monitor product availability, manage supplier relationships, and coordinate distribution activities more effectively. As a result, MSMEs that adopted digital technologies demonstrated greater adaptability and resilience compared to those relying solely on conventional business practices.



Figure 1. Digitalization Framework for Enhancing MSME Competitiveness

Despite these benefits, the study identified several challenges that hinder the effective adoption of digital technologies. Limited digital literacy remains a significant obstacle, particularly among small-scale entrepreneurs operating in rural areas. Many MSME owners reported difficulties in utilizing advanced digital applications due to a lack of technical knowledge and training opportunities. Financial constraints also emerged as a major challenge, as some businesses lacked the resources required to invest in digital infrastructure, software, and professional digital marketing services. In addition, inadequate internet connectivity in certain areas further limited the effectiveness of digital transformation initiatives.

Another important finding concerns the growing implementation of green entrepreneurship practices among local food MSMEs. The study found that several enterprises have begun integrating environmental considerations into their business operations. These practices include the use of locally sourced raw materials, waste reduction initiatives, environmentally friendly packaging, energy-efficient production processes, and efforts to minimize environmental impacts throughout the production cycle. Such initiatives were motivated not only by environmental awareness but also by the potential economic benefits associated with resource efficiency and increasing consumer demand for sustainable products.

The findings further indicate that green entrepreneurship contributes to business sustainability by reducing operational costs and enhancing product differentiation. MSMEs that adopted environmentally friendly practices reported improved customer trust and stronger brand reputation. Consumers increasingly perceive sustainable products as healthier, safer, and more socially responsible, thereby creating additional market opportunities for environmentally conscious enterprises. Consequently, green entrepreneurship emerged as both an environmental strategy and a competitive business strategy for local food MSMEs.

A particularly significant finding of this study is the synergistic relationship between digitalization and green entrepreneurship. The results suggest that digital technologies facilitate the promotion and distribution of environmentally friendly products, while green entrepreneurship enhances the value proposition of products marketed through digital channels. This integration creates mutually reinforcing benefits that improve business performance, market competitiveness, and long-term sustainability. MSMEs that simultaneously adopted digital technologies and sustainable business practices demonstrated higher levels of innovation, efficiency, and customer engagement compared to those implementing only one of these approaches.

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The study also highlights the strategic role of the Free Nutritious Meal Program (MBG) as a catalyst for MSME development. The program provides a stable demand for nutritious food products, creating opportunities for local food MSMEs to participate in public food supply systems. Participation in the program encourages MSMEs to improve product quality, strengthen food safety standards, and increase production capacity. Moreover, the program creates incentives for businesses to adopt sustainable production practices and improve operational efficiency in order to meet procurement requirements.

From a social perspective, the integration of digitalization, green entrepreneurship, and the MBG program contributes significantly to improving community welfare. The findings indicate that local food MSMEs not only generate employment opportunities and stimulate local economic growth but also contribute directly to improving access to nutritious food among vulnerable populations. This demonstrates that MSMEs can function as important agents of social development while simultaneously achieving economic and environmental objectives.

Based on these findings, this study proposes a new conceptual framework referred to as the Integrative Transformation Model of Local Food MSMEs. The model suggests that sustainable MSME transformation can be achieved through the integration of three interconnected dimensions: digitalization, green entrepreneurship, and social food programs. Digitalization serves as the primary driver of market expansion and operational efficiency, green entrepreneurship ensures environmental sustainability and resource optimization, while the MBG program provides social value and market opportunities. The interaction among these dimensions creates a sustainable ecosystem that promotes business growth, environmental responsibility, and equitable access to nutritious food.

Ultimately, the findings demonstrate that the future sustainability of local food MSMEs depends not only on economic performance but also on their ability to embrace technological innovation, environmental responsibility, and social contribution simultaneously. The proposed model provides a comprehensive framework for understanding how these elements can be integrated to strengthen food security, enhance MSME competitiveness, and support sustainable development goals at both local and national levels.

DISCUSSION

The findings of this study demonstrate that digitalization plays a fundamental role in transforming local food-based MSMEs and enhancing their capacity to contribute to food security initiatives. The adoption of digital technologies enables MSMEs to improve

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operational efficiency, expand market access, strengthen customer engagement, and optimize supply chain management. These findings support the work of Kraus et al. (2022), who argued that digital transformation has become a critical factor in improving organizational resilience, innovation capability, and long-term competitiveness. Similarly, Sivaiah and Vinodan (2026) emphasized that digitalization enables MSMEs to overcome market limitations, reduce transaction costs, and strengthen business sustainability in increasingly dynamic economic environments.

The present study further reveals that digital marketing platforms, e-commerce systems, and digital payment technologies significantly improve the ability of food MSMEs to reach broader consumer markets. This finding is consistent with previous research by Chatterjee et al. (2021), which found that digital technologies improve business performance by facilitating customer interaction, enhancing market intelligence, and supporting more effective promotional strategies. Likewise, Alkhasoneh et al. (2025) reported that social media marketing positively influences customer engagement and brand awareness among Indonesian MSMEs. Therefore, the findings reinforce the growing consensus that digital transformation is no longer optional but has become an essential requirement for MSME competitiveness and sustainability.

Despite these benefits, this study identified several barriers to digital transformation, including limited digital literacy, inadequate technological infrastructure, financial constraints, and insufficient managerial capabilities. These findings are consistent with those of Alfrian and Pitaloka (2020), who found that many Indonesian MSMEs continue to face difficulties in adopting digital technologies due to limited knowledge, lack of training opportunities, and inadequate access to technological resources. Similarly, Nasution and Indria (2021) observed that although many MSMEs have adopted online sales channels and digital payment systems, substantial gaps remain in branding, digital marketing capabilities, and strategic utilization of digital platforms. These challenges indicate that digital transformation requires not only technological adoption but also continuous capacity building and institutional support.

Another important finding of this study concerns the contribution of green entrepreneurship to the sustainability of local food MSMEs. The results indicate that environmentally friendly business practices, including the use of local raw materials, waste reduction strategies, sustainable packaging, and efficient resource utilization, provide both environmental and economic benefits. These findings support the argument of Belz et al. (2025), who emphasized that sustainability-oriented entrepreneurship creates value by simultaneously addressing economic, environmental, and social

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objectives. The integration of environmental responsibility into business operations allows firms to strengthen their market position while responding to increasing consumer demand for sustainable products.

One of the most distinctive findings of this study is the strategic role of the Free Nutritious Meal Program (MBG) in connecting business transformation with social development objectives. Existing literature on MSME digitalization and green entrepreneurship has predominantly focused on firm-level outcomes such as profitability, productivity, innovation, and environmental performance. However, the present study demonstrates that these approaches can also generate broader societal impacts when linked to social programs aimed at improving nutritional access and food security. This finding expands the conventional understanding of sustainable entrepreneurship by incorporating social welfare outcomes into the evaluation of business transformation initiatives.

The results further suggest that the MBG program functions as a demand-side mechanism that stimulates local food production while simultaneously promoting social inclusion. By creating stable market opportunities for local food MSMEs, the program encourages entrepreneurs to improve quality standards, increase production capacity, and adopt sustainable business practices. This observation is consistent with the findings of Dorvlo et al. (2025), which emphasize that local food systems and small-scale enterprises play a crucial role in strengthening food security and improving nutritional outcomes. Consequently, integrating MSMEs into public food procurement systems can generate substantial economic and social benefits.

From a theoretical perspective, the findings contribute to the literature by proposing the Integrative Transformation Model of Local Food MSMEs. Unlike previous frameworks that focus solely on technological adoption or environmental sustainability, the proposed model incorporates three interconnected dimensions: digitalization, green entrepreneurship, and social food programs. The model suggests that sustainable MSME transformation is achieved when technological innovation, environmental responsibility, and social value creation are integrated into a unified development strategy. This perspective broadens existing theories of MSME development by emphasizing the importance of balancing economic, environmental, and social objectives.

The proposed model also reflects the principles of the Triple Bottom Line framework developed by Elkington and Rowlands (1999), which advocates balancing economic prosperity, environmental stewardship, and social equity. However, this study extends the framework by positioning social food programs as an active mechanism that

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links business transformation with food security outcomes. Consequently, the model offers a more comprehensive explanation of how MSMEs can contribute simultaneously to economic development, environmental sustainability, and social welfare.

In terms of practical implications, the findings suggest that policymakers should design integrated support programs that combine digital capacity building, sustainability-oriented entrepreneurship training, financial assistance, and participation opportunities in public food programs. Such integrated interventions are likely to generate stronger outcomes than isolated initiatives focusing solely on technology adoption or environmental management. Furthermore, collaborations among governments, educational institutions, private sector actors, and local communities are necessary to create an enabling ecosystem that supports sustainable MSME transformation.

Overall, this study demonstrates that the sustainable transformation of local food MSMEs requires a holistic approach that integrates digitalization, green entrepreneurship, and social food initiatives. The proposed theoretical model provides a novel framework for understanding how these elements interact to enhance MSME competitiveness, strengthen food security, promote environmental sustainability, and improve community welfare. As such, the study contributes both theoretically and practically to the growing discourse on sustainable entrepreneurship, digital transformation, and food system resilience.

Based on the findings, this study proposes the Integrative Transformation Model of Local Food MSMEs. The model suggests that digitalization and green entrepreneurship function as complementary drivers of MSME transformation, while the Free Nutritious Meal Program acts as a social mechanism that links business development with food security outcomes. The interaction among these elements generates economic, environmental, and social benefits, thereby supporting sustainable food security and MSME competitiveness.

CONCLUSION

This study concludes that digitalization and green entrepreneurship are important factors in strengthening the competitiveness and sustainability of local food MSMEs. Digital technologies enhance operational efficiency, expand market access, and improve business performance, while green entrepreneurship promotes environmentally responsible production and long-term business sustainability. The findings also indicate that the integration of these approaches can support the implementation of the Free Nutritious Meal Program (MBG) by improving the capacity of local food MSMEs to provide

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nutritious and sustainable food products. Therefore, greater support from governments and stakeholders is needed to encourage digital adoption and sustainable business practices among MSMEs in order to strengthen food security and community welfare.

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