

Community-Based Intervention to Promote Moringa Utilization for Nutrition Improvement and Sustainable Livelihoods

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DOI: <https://dx.doi.org/10.47772/IJRISS.2026.10200583>

Received: 06 February 2026; Accepted: 07 March 2026; Published: 21 March 2026

ABSTRACT

Moringa (kelor) is a nutrient-dense "miracle tree" known for its high vitamin and mineral content, which benefits newborns, children, and pre- and pregnant women. It promises to treat stunting and malnutrition. While the Indonesian government promotes moringa, widespread adoption remains limited due to cultural misconceptions, poor public knowledge, and lack of collaboration. This study aims to promote moringa utilization through a community-based intervention trial in Bekasi Regency, focusing on families having access to local moringa trees, resulting in enhanced perceptions of moringa's health benefits and higher family consumption. Community members were engaged in entrepreneurial and nutritional activities through participatory techniques such as culinary demos, teaching workshops, and small-scale product development. Monthly health seminars were held in an area of Bekasi Regency during a five-month period, with roughly 100 participants. Mrs. Milah is a local inventor who created moringa-based products such as chips, pudding, meatballs, and sambal, increasing children's acceptability and household income while also providing as an example of successful SMEs promoting healthful snack options in the community. The results reveal enhanced views of moringa's health advantages, increased household consumption, and the expansion of community-based micro-enterprises. Mrs. Milah, whose moringa-based innovations have become a local SME model, reported that demand for moringa products increased about fivefold while revenues quintupled as a greater number of people in the community repurchased the product after realizing the benefits of Moringa consumption. Moringa pudding has also been promoted in communities through Posyandu events as part of stunting prevention initiatives. These findings show moringa's potential for improving nutrition and promoting sustainable livelihoods. This study proposes a scalable methodology for combining nutrition improvement with rural business. Collaboration between the government, academia, and the corporate sector must be strengthened in order to increase moringa cultivation training, market access, and community motivation.

Keywords: Community-Based Intervention, Moringa Oleifera, Nutritional Products Development, Stunting Reduction, Sustainable Livelihood

INTRODUCTION

The suitable nutrition can significantly influence children's growth and development. Using Moringa Oleifera as a dietary supplement is a natural technique to boost health that is gaining popularity. Moringa Oleifera is the most popular and frequently grown kind of moringa. It has the greatest nutrients, making it an excellent choice for adding to meals on a big scale. It contains a lot of important minerals including iron, protein, and vitamin C, which are incredibly beneficial to mothers' health and children's growth (1, 2). Moringa Oleifera is becoming

increasingly popular for maternal and child health initiatives since it is very nutritious and grows well in tropical regions. It greatly aids in the treatment of problems like as malnutrition, stunting, and anemia (3, 4). *Moringa Oleifera* thrives best in hot, humid environments, particularly in South and Southeast Asia. It has shown the highest growth and nutrient production when grown on Indonesian soil (5). *Moringa Stenopetala* and *Moringa Peregrina*, which are typically grown in arid locations, have significantly lower nutritional value (6). Furthermore, cultivating moringa in nontropical areas, such as many Western and subtropical countries, is not always practicable due to poor soil and weather (7). Despite its promise, moringa's acceptance in Indonesia remains restricted.

In addition to its nutritional advantages, *Moringa Oleifera* includes bioactive chemicals, natural anti-inflammatories, and antioxidants that help with postpartum recovery and maternal fitness. The International Journal of Food Sciences and Nutrition discovered that moringa supplementation improves nursing breast milk quality and may prevent mild to severe anemia during pregnancy. The plant's nutritional value, cost-effectiveness, and availability make it ideal capsules, powder, biscuits, teas, and local complementary meals (MP-ASI) (8,9). According to the Ministry of Health, stunting is more common throughout the prenatal, perinatal, and early infancy stages. During pregnancy, 16.9% of women had anemia and 44.2% had Chronic Energy Deficiency (KEK), indicating insufficient macronutrient and micronutrient intake (10). Recently, the number of women at risk of KEK has risen, whereas prenatal consultations (K4) have dropped. Nutritional deficits persist postpartum. The prevalence of insufficient exclusive breastfeeding during the first 1,000 days of life is 68.6%, indicating a nutritional deficit (11). Additional feeding strategies are often ineffective, with 78.4% of newborns getting MP-ASI, which overuses animal products (12).

Stunting rates in Indonesia fell from 40-46% in the 1990s to 37% by 2013. During President Joko Widodo's administration, the rate fell from 37% in 2014 to 30.8% in 2018, then to 24.4% in 2021 and around 21.5-21.6% in 2022-2023 (13). Nonetheless, twelve localities continue to record rates higher than 30% (14). The national goal for 2024 is to reduce stunting to 14%, exceeding the Ministry of National Development Planning's (Bappenas) target of 19%. Only three provinces—Riau, Jambi, and Bali—have stunting rates below 14% (15). Stunting can impede cognitive development, reduce cognition, and raise the risk of chronic illnesses in later life, endangering national human capital (16). The Bekasi Regency Government aims to reduce the prevalence of stunting to a single-digit percentage. Acting Head of Bappeda Bekasi, Ida Farida, emphasizes the importance of mass media in informing the public about balanced nutrition, sanitation, and the use of local foods, such as nutrient-dense moringa leaves (17).

President Prabowo Subianto's national policy highlights the need of achieving food and nutrition security by effectively utilizing climate-resilient natural resources, beginning at the village level. *Moringa Oleifera*'s strategic advancement aligns nicely with Indonesia's long-term development goals (18). To realize the target of a "Golden Indonesia 2045," the government must invest in and improve the quality of its human resources. A strong, efficient, and competitive population is the foundation of national growth. A main goal in the health sector is to reduce stunting, a condition in children under the age of five characterized by stunted growth and development due to chronic malnutrition (19). Despite progress, Indonesia continues to record stunting prevalence rates over the World Health Organization (WHO) threshold of 20% (20). Moringa and other nutrient-dense foods available locally assist to make up for this nutritional deficiency. Furthermore, despite recent advances, communal food efforts such as moringa usage have received little attention.

Combating stunting is a global priority under the Sustainable Development Goals (SDGs), particularly SDG 2, which aims to eliminate all forms of malnutrition by 2030. This includes stunting and undernutrition in children, adolescent girls, pregnant and breastfeeding mother, and the elderly (21). Moringa, recognized for its high nutritional content and accessibility, offers a practical and long-term alternative.

In line with the Sustainable Development Goals (SDGs), the Indonesian government has launched a comprehensive effort to reduce stunting, summarized in the "Five Pillars of Stunting Prevention": 1. Leadership commitment and a definitive vision

2. National behavioral change campaigns

3. Program convergence and inter-sectoral coordination

4. Food and nutrition security

5. Robust monitoring and evaluation systems.



Figure 1. Five Pillars of Stunting Prevention

Annual budgetary resources continue to rise to support these activities (22). Appropriate dietary treatments can have a significant influence on children's growth. The use of Moringa (*Moringa Oleifera*) as a natural nutritional intervention food addition is one potential approach that may be applied and is now being explored (23).

Moringa *Oleifera*'s inclusion into functional food innovation represents both a commercial opportunity and a strategic response to government measures aimed at reducing stunting. The evidence-based development of moringa products addresses two major issues: a lack of low-cost, high-quality local food alternatives for low-income people, and insufficient nutritional intake among mothers and babies (24). The initiative demonstrates a social intervention model that combines agricultural technology, maternal and child health, and local economic development using sustainable agriculture approaches. Despite moringa advertising, uptake is limited by cultural misconceptions, a lack of public education, and lack of collaboration. As a result, the goal of this study is to demonstrate how Moringa benefits communities by improving attitudes, increasing household consumption, and fostering the formation of community-driven micro-enterprises.

METHOD

This study used Participatory Action Research (PAR) to engage the community in cooperatively generating ideas (25) to enhance the use of moringa. Over a five-month period, monthly health seminars in a Bekasi Regency area involved around 100 participants in culinary demonstrations, instructional workshops, and small-scale product creation, providing practical experience in nutrition and entrepreneurship (26, 27). Researchers collected detailed and contextually relevant information through counseling, culinary activities, and capacity-building programs, all while encouraging knowledge sharing and problem resolution.

Mrs. Milah, a local developer, produced moringa-based items such as chips, pudding, meatballs, and sambal, increasing children's acceptance and household income. Her goods solidified their reputation as a symbol of healthy delights, acting as a model for small and medium-sized businesses fighting for healthful choices in the community. This participatory approach highlights the need of direct community participation in increasing moringa consumption and supporting locally generated nutrition and livelihood programs.

RESULT AND DISCUSSION

Based on the findings of research conducted in Bekasi district with Mrs Milah as the community figure, several things can be explained, including a shift in the perception of Moringa *Oleifera* as a functional food that can be consumed as a health supplement and nutrition intervention for stunting-free communities. The results also reveal an increase in understanding of the need of developing environmentally friendly company operations to

promote environmental sustainability and to have an influence on rural communities' economic activities by boosting the daily revenue they earn. Here are the findings of this study.

1. Enhanced Community Perceptions and Moringa Consumption

According to observations made before to the intervention, there was a widespread belief in the Mrs Milah community that Moringa Oleifera is merely a functional ingredient, similar to jamu, that provides little therapeutic advantages and is exclusively used by the poor. This stigma issue was also employed as a result of study (28), which revealed that moringa leaves in Mliwang village have a poor appeal and are only eaten as herbal medicine when sick by the lower middle class. The similar occurrence occurs in Jebrana (29), where jobless moms turn moringa into tea powder and scrubs, demonstrating that moringa is used as a functional healing agent rather than the primary element for stunting prevention. According to study conducted in the Pandalungan community (30), East Java, 28% of respondents solely utilized moringa as herbal medicine, with just 30% processing moringa as part of everyday side meals.

This suggests that, rather than being viewed as a nutritious diet, moringa is still primarily regarded as a therapeutic plant. Because they are associated with low socioeconomic status, extremely nutritious indigenous vegetables are overlooked, a phenomenon known as "culinary exclusion." This situation is consistent with Indonesia's local food stigma, where indigenous foods such as tempe, cassava, and moringa are frequently regarded as less prestigious than processed or imported meals (31). The post-intervention qualitative data from the focus group discussions demonstrated that multiple stakeholders, including the local government and academics, had changed their perceptions prior to the intervention. Participants reported feeling more confident in Moringa's nutritional advantages after attending workshop sessions that focused on the plant's high levels of vitamins A and C, iron, calcium, and antioxidants.

In addition, the findings revealed changes in the frequency and diversity of Moringa Oleifera ingestion. Prior to the intervention, Mrs Millah only manufactured chips using Moringa Oleifera as the major component, demonstrating a limited knowledge on Moringa Oleifera-based processing procedures. However, following the intervention, which included training, culinary demonstrations, and nutrition advising sessions, the range of goods produced increased significantly. Mrs. Milah and her team began producing moringa dishes such as pudding, meatballs, moringa chili sauce, and moringa flour to supplement family meals. This is important for increasing community trust and acceptance of Moringa Oleifera, which has been tailored to local culture. The items have been shown to be favoured due to their more appealing form, flavour, and appearance, particularly among toddler groups and pregnant or nursing moms.

The author's action attempts to change people's ideas about moringa, particularly among those who have achieved higher social mobility and have left traditional Indonesian culture to pursue more contemporary consumption practices. With this activity, the author hopes to rebrand moringa by educating or raising literacy, counselling, and culinary sessions with various forms of creativity that may be carried out in public. Thus, Moringa may be reinvented as a food ingredient that aligns with the WHO tagline, "Superfoods that prevent stunting, drive the community's economy, and become the pride of Indonesian farmers," particularly in the region where this research was performed, Bekasi Regency. This also demonstrates that participatory interventions may alter the community's use of Moringa Oleifera into functional consumption patterns with high nutritional value for stunting prevention.

2. Microenterprise Development and Economic Impact

Aside from its excellent nutritional value, the development of Moringa Oleifera has a systematic and significant economic impact. Structured because all steps of the supply chain are sourced from the local community, from raw material processing and farming to manufacture, distribution, and post-consumption. Thus, Moringa Oleifera has significant economic significance for poverty reduction and the filling of employment shortages in the local community, specifically the Bekasi region. Mrs Milah has become proof of a successful program by developing her business and creating job opportunity in her surrounding community. Mrs Milah also stated that her business's income increased significantly, with revenues quintupling as more individuals in the neighbourhood repurchased the product after learning about the advantages of Moringa use. During the 5-month

intervention phase, the author successfully conducted nutrition and creative business seminars for Mrs Milah and the surrounding community. The community identified formalized supply chain, packaging skills, and stable access to funding as needed. This demands more collaboration between the public and private sectors to create an environment that fosters moringa entrepreneurship. Moringa's nutrient-dense, natural, easily available, and inexpensive composition allows it to be processed into a variety of practical forms, including capsules, powder, biscuits, tea, and local supplemental meals for children.

The manufacturing of high-quality Moringa powder is the most effective solution for eradicating stunting and malnutrition because it concentrates the plant's many vitamins into a shelf-stable, easily consumable form. This nutritional powerhouse has progressed from a simple garden treatment to a sophisticated "superfood" product that promotes public health and regional economic development. The actual economic potential of this transformation was unlocked by Dudi Krisnadi, the Moringa Nutrition Lock Method's inventor. He understood that, while Moringa was an important tool in combating malnutrition, its market viability was strongest among health-conscious, middle-to-upper-class customers (32). Krisnadi converted a common plant into a luxury product by switching from traditional drying to a scientifically rigorous SOP that "locks" in important vitamins and minerals, growing his business to an annual revenue of Rp 4 billion. Syahrani Devi, who converted a personal healing journey into a professional purpose, exemplifies the path from local horticulture to high-stakes commerce (33). She went from a small business to a successful exporter by taking use of the many Moringa trees in her surroundings. Together, these experiences show that when local actors bridge the gap between nutritional research and business, Moringa powder becomes more than just a supplement; it becomes a powerful engine for poverty reduction and worldwide trade.

Business innovation that incorporates moringa into functional food items is not just an economic opportunity, but also a practical answer to help government initiatives accelerate stunting elimination. The creation of evidence-based moringa products will help solve two key issues at once: mothers' and babies' nutritional intake, and the scarcity of high-quality local goods at reasonable pricing in the lower-income population. Thus, this strategy is more than simply a business; it is a type of social intervention that connects food technology, mother and child health, and local economic development through sustainable moringa farming. The findings of this study are also consistent with previous research (34), which found that the Moringa commercialization process has a positive impact on the community economy in Ghana, increasing people's income and nutritional quality, ultimately improving the quality-of-life index.

Local small and medium businesses (SMEs) in Indonesia play an important role in promoting nutrient-dense crops like Moringa oleifera, which benefits both domestic nutrition and revenue development. Community-driven initiatives, such as Mrs. Milah's moringa-based products in Bekasi, have increased consumption and supported the creation of micro-enterprises, therefore assisting the government's efforts to combat stunting. The worldwide superfood sector is expanding rapidly, and goods enhanced with moringa, such as chips, crackers, and bars, have showed the capacity to improve nutritional profiles while maintaining consumer appeal. Despite this worldwide evidence, major study gaps exist in Indonesia regarding market scalability, SME adoption, local supply chains, cost-benefit evaluations for small businesses, and consumer demand, particularly in rural areas. This highlights the importance of the current study in determining the viability, acceptance, and impact of moringa-based refreshment items on local SMEs and communities.

3. Multi-stakeholder Collaboration and Sustainability

Stunting is a major condition that affects cognitive development and motor abilities. This research emphasizes the necessity of collaborative efforts among government agencies, non-governmental organizations (NGOs), the private sector, academic institutions, and communities in addressing this situation. Coordinated initiatives in the Bekasi Regency address health, education, the environment, and food security, demonstrating that preventing stunting requires consideration of not just additional food but also associated variables like as cleanliness and caregiving habits.

The worldwide superfood industry is rapidly rising, with forecasts showing that it will reach USD 328.28 billion by 2030 (35). Moringa products are becoming increasingly popular in Indonesia, appealing to a broad population that includes pregnant women and Generation Z. Moringa-based snacks, with their high nutritional content and

low cost, can improve community nutrition while also supporting local SMEs. This is demonstrated by Mrs. Milah's successful moringa products, which also serve as an example for nutritious snacking. Nonetheless, MSMEs face a variety of problems, including difficulty with licensing, access to funding, and the need for market education. Multisectoral assistance is essential: the government may simplify permits and reduce bureaucracy, academics can provide nutritional education and product development advice, and the corporate sector can give logistics, equipment, and cash. Collaboration among stakeholders and active community engagement are critical for expanding moringa-based companies, improving nutrition, and creating long-term economic prospects. Finally, these activities must be coordinated to support national health measures as a matter of urgent need. Specifically, the discussion about including Moringa powder into Indonesia's Makan Bergizi Gratis (MBG) program (36) is more than just a proposal; it is a strategic imperative that must be adequately supported to enable its effective implementation. By incorporating this nutrient-dense "superfood" into the national menu, the government can capitalize on a locally supplied, scientifically proven option to achieve the vital aim of eliminating stunting countrywide. Supporting the MBG program through the inclusion of Moringa is the most practical way to improve Indonesia's nutritional landscape while also benefiting the local micro-enterprises that generate it.

Despite the substantial advances made by local players, certain institutional restrictions must be addressed to ensure the Moringa revolution's long-term viability and influence on micro-enterprise growth. Scaling these businesses necessitates bridging a persistent "quality gap," as most SMEs continue to struggle with the high expenses of laboratory testing and specialized equipment required to obtain the consistent nutritional profiles observed in Dudi Krisnadi's "Nutrition Lock" technique. Furthermore, cultural and sensory barriers—such as Moringa's distinct "earthy" taste profile and the persistent reputation of Moringa as a "poor man's food"—require ongoing culinary innovation and social marketing to retain community acceptability beyond the first intervention. These issues are exacerbated by the financial weakness of SMEs like Buk Milah, who are still vulnerable to supply chain changes and a lack of structured "off-taker" arrangements. As a result, incorporating Moringa into the Makan Bergizi Gratis (MBG) program is not only a nutritional strategy, but also an economic necessity; it provides the guaranteed market and standardized demand needed to transition these enterprises from fragile local successes to a stable, national industrial force capable of permanently eradicating stunting.

CONCLUSION

Given the study's background and conclusions, it is critical that Indonesia address stunting. One such strategy is to employ Moringa oleifera, which has demonstrated clinical and health benefits. Nonetheless, difficulties exist, such as a lack of understanding of moringa's nutritional advantages and persistent negative beliefs that limit public use, as shown in the Buk Milah hamlet in Bekasi Regency. The study's findings suggest several interventions: raising community awareness to reestablish moringa as a nutritious and accessible food source, establishing micro-enterprises to advocate for moringa-based products as income-generating ventures, and encouraging multisectoral collaboration among government entities, NGOs, private enterprises, and academia to foster an innovative and competitive business landscape. Community-based moringa entrepreneurship provides a replicable structure that may be deployed nationally to supplement SME revenue output while also improving community nutrition to avoid stunting. Improving collaboration among government, academia, and the private sector is critical for expanding training, improving market access, and incentivizing communities to cultivate moringa, demonstrating a scalable method for combining rural economic empowerment with national nutrition enhancement initiatives. Finally, the discussion of including Moringa powder into Indonesia's Makan Bergizi Gratis (MBG) program is a strategic imperative that must be adequately supported to enable its effective implementation.

ACKNOWLEDGEMENT

The authors thank Fakulti Pengurusan Teknologi dan Teknousahawanan (FPTT), Universiti Teknikal Malaysia Melaka (UTeM), for financial assistance and facilities that facilitated the completion of this research. The authors would like to thank the Centre of Technopreneurship Development (CTeD) of UTeM for their direct and indirect contributions. In addition, the authors thank President University for encouraging engagement with SMEs to build more competitive and creative firms.

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