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Strengthening Banana Chips MSME Empowerment through Appropriate Production Technologies and Digital Bookkeeping in Pamijahan Village

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Abstract

This community service program aimed to strengthen the empowerment capacity of banana chips micro, small, and medium enterprises (MSMEs) through appropriate production technologies and digital bookkeeping in Pamijahan Village, Bogor Regency, West Java, Indonesia. The program was implemented from June to October 2025 and involved 19 women MSME actors who were members of a local PKK-based banana chips business group. A participatory and practice-based approach was applied through five stages: needs assessment, training, technology implementation, mentoring, and evaluation. The production intervention included hygienic production training, the use of a banana slicing machine, an oil spinner, and hygiene equipment. The business management intervention focused on digital bookkeeping, cash-flow understanding, simple financial recording, and business planning assistance. The evaluation used descriptive indicators to compare partner conditions before and after the program. The results showed improvements in production efficiency, product consistency, hygienic practices, appropriate technology use, digital bookkeeping adoption, cash-flow understanding, and simple business planning. Production efficiency, based on observed reductions in slicing and oil-reduction time supported by partner reports, increased by up to 30%. In addition, all participants used hygiene equipment during production practice, and 15 out of 19 participants, or approximately 79%, began recording income and expenses using a simple digital bookkeeping application. The program indicates that the integration of appropriate production technologies and digital bookkeeping can serve as a practical empowerment model for women-led food-based MSMEs in rural communities.

Keyword: Community Empowerment; Banana Chips MSMEs; Appropriate Technology; Digital Bookkeeping; Women-led MSMEs

INTRODUCTION

MSMEs and Rural Economic Empowerment

Micro, small, and medium enterprises (MSMEs) play a strategic role in rural economic development, particularly as sources of household income, local employment, and productive community participation. In Indonesia, MSMEs are widely recognized as an important pillar of

the national economy because they contribute substantially to gross domestic product and employment absorption (Direktorat Jenderal Perbendaharaan, 2023). At the village level, MSMEs are not only economic units, but also community-based institutions that enable households to utilize local resources, generate income, and strengthen economic resilience.

Rural MSMEs are often closely connected to local raw materials, household-based production systems, and informal community networks. This condition makes them important vehicles for inclusive economic empowerment, especially when business activities involve women as producers, managers, and decision-makers within the household economy. Women-led MSMEs in food processing sectors can transform domestic skills into productive economic activities. However, their contribution depends on the extent to which they can improve production capacity, adopt appropriate technology, and manage business activities more systematically.

Food-based MSMEs require continuous capacity strengthening because their competitiveness is shaped not only by product taste, but also by production efficiency, product consistency, hygiene, packaging, and basic business management. Many household-based food businesses still operate with informal production practices and weak financial administration. As a result, MSME actors often face difficulties in evaluating production costs, calculating profit, monitoring cash flow, and preparing documents required for business development. Therefore, rural MSME empowerment should not be limited to entrepreneurship motivation or market promotion, but should also include practical capacity building in production and financial management.

Challenges of Food-based MSMEs

Food-based MSMEs commonly face operational and managerial constraints. On the production side, traditional processing methods often lead to inefficient workflows, inconsistent product quality, and limited hygienic control. Manual equipment can slow down production, create variation in product size and texture, and reduce the ability of MSMEs to maintain stable output. For snack products such as banana chips, consistency in slicing, frying, oil reduction, and packaging plays an important role in determining product quality and consumer acceptance.

From a managerial perspective, many small food enterprises still rely on informal financial practices. Income and expenses are often not recorded systematically, while household and business finances tend to overlap. This condition makes it difficult for MSME actors to understand cash flow, calculate profit margins, control production costs, and prepare financial documents required for access to financing. Previous studies indicate that financial literacy and digital financial literacy are important for improving MSME performance, financing decisions, and financial inclusion (Al-shami et al., 2024; Diptyana et al., 2022; Goyal & Kumar, 2021).

The adoption of technology and digital tools is increasingly important for MSME sustainability. Financial and technological factors have been shown to influence digital adoption, which in turn contributes to SME performance and long-term business sustainability (Kurniasari et al., 2023). However, technology adoption in rural MSMEs should be aligned with users' needs, skills, and local context. For household-based food-processing MSMEs, the most relevant intervention is not necessarily complex digital transformation, but the introduction of simple, affordable, usable, and problem-oriented technologies.

Appropriate Production Technologies and Digital Bookkeeping as Capacity-building Instruments

Appropriate technology is relevant in community empowerment because it emphasizes the fit between technology, user capability, local needs, and sustainability. Patnaik & Tarei (2022) argue that the appropriateness of technology should be understood through its economic, social, ethical, and environmental relevance. Similarly, Shin et al. (2019) emphasize that successful appropriate technology initiatives require grassroots participation and local contextual understanding. In the context of rural food-based MSMEs, production technologies such as slicing machines, oil spinners, and hygiene-supporting equipment can be considered appropriate when they directly respond to operational constraints and can be used independently by community members.

Appropriate production technologies can strengthen MSMEs by improving efficiency, standardizing production processes, and reducing product quality variation. For banana chips producers, the use of a banana slicing machine can help create more uniform slices, while an oil spinner can reduce oil content and improve product crispness. Hygiene equipment such as masks, gloves, aprons, and head covers can also encourage safer and cleaner food-processing practices. Although these interventions are relatively simple, they can create meaningful improvements in production discipline and product quality.

In parallel, digital bookkeeping can strengthen business management capacity. Simple digital financial recording allows MSME actors to document income, expenses, profit, and cash flow more consistently. Digital bookkeeping is particularly important for micro and household-based enterprises because it helps business owner's separate business finances from household consumption, evaluate business performance, and prepare basic documents for financing. Studies on financial literacy and digital financial literacy show that stronger financial capability can support financial inclusion, business decisions, and enterprise performance (Adomako et al., 2016; Al-shami et al., 2024; Diptyana et al., 2022).

Context of Banana Chips MSMEs in Pamijahan Village

Pamijahan Village in Bogor Regency has local potential for the development of banana-based food products. The partner group in this community service program consisted of women MSME actors who produced banana chips as a household-based business. The group had operated the business for more than five years, but its production and business management practices remained relatively traditional. The initial assessment showed that production still relied on manual tools, product quality was not fully consistent, and financial records were not systematically documented.

The production process faced several practical limitations. Banana slicing was conducted manually, resulting in variation in slice thickness and product texture. The oil reduction process was also limited, which affected product crispness and shelf life. In addition, hygienic production practices had not been fully standardized. From the business management side, partners did not yet have structured records of income, expenses, and profit. This condition limited their ability to evaluate business performance, manage cash flow, and prepare for business expansion.

Based on these conditions, the program focused on two foundational empowerment aspects: production capacity and business management capacity. The production intervention included hygienic production training, implementation of a banana slicing machine, use of an oil spinner, and application of hygiene equipment. The business management intervention focused on digital bookkeeping training, simple cash-flow understanding, and basic business planning. These two aspects were selected because they represent essential requirements for

transforming household-based food production into a more organized and sustainable MSME activity.

Program Gap and Article Objective

Many community service programs for MSMEs emphasize digital marketing, branding, and online sales. These interventions are important for expanding market access and increasing consumer visibility. However, for rural food-based MSMEs, market expansion should be supported by production readiness and financial management discipline. Without consistent product quality and clear financial records, digital marketing may increase exposure without ensuring business sustainability.

Although previous studies have discussed the importance of digital adoption, financial literacy, and technology use for MSME performance (Al-shami et al., 2024; Kurniasari et al., 2023; Wardana et al., 2023), fewer community service articles specifically examine how appropriate production technologies and digital bookkeeping can jointly strengthen the empowerment capacity of women-led food MSMEs in rural settings. Therefore, this article addresses a practical gap in community service literature by examining the integration of production technology and digital financial recording as complementary empowerment instruments.

This article aims to describe the design, implementation, and outcomes of a community service program designed to strengthen banana chips MSME empowerment through appropriate production technologies and digital bookkeeping in Pamijahan Village. Specifically, the article discusses how practical production technologies and simple digital bookkeeping practices contributed to improved production efficiency, product consistency, hygienic practices, financial recording discipline, cash-flow understanding, and business readiness among women-led MSMEs.

METHOD

Program Site and Participants

This community service program was conducted in Pamijahan Village, Bogor Regency, West Java, Indonesia. The program was implemented from June to October 2025, covering needs assessment, training, mentoring, and evaluation activities. The partner group consisted of 19 women MSME actors who were members of a local PKK-based banana chips business group. The participants were selected purposively because they were actively involved in banana chips production, had operated the business for more than five years, and faced practical limitations in production technology and business management.

Pamijahan Village was selected because the area has local potential for banana-based food processing, particularly through the availability of banana raw materials and the presence of women-led household businesses. The partner group still relied on household-based production practices and simple manual equipment, which affected production efficiency, product consistency, hygienic practice, and financial management discipline. In addition, the group demonstrated a strong willingness to participate in training, technology adoption, and mentoring activities. This condition made the group suitable for a community empowerment program that combined appropriate production technologies and digital bookkeeping.

Community Service Approach

The program applied a participatory and practice-based community service approach. This approach was selected because the program aimed not only to transfer knowledge, but also to involve partners in identifying problems, practicing new skills, applying production technologies, and evaluating

changes in their own business activities. Participatory approaches are relevant in community-based empowerment because they position community members as active subjects of change rather than passive recipients of assistance (Israel et al., 2022; Minkler & Wallerstein, 2021).

The implementation model combined needs assessment, hands-on training, experiential learning, technology implementation, mentoring, and descriptive evaluation. Consistent with participatory community empowerment principles, the program emphasized direct engagement with partners, practical skill development, and post-training assistance to support observable changes in partner practices.

The program was implemented through five stages. The first stage was needs assessment, which was conducted through field observation, informal interviews, and group discussion with partners. The second stage was training, which introduced hygienic production practices and digital bookkeeping. The third stage was technology implementation, which focused on the use of a banana slicing machine, an oil spinner, hygiene equipment, and a simple bookkeeping application. The fourth stage was mentoring, which supported partners in applying the new skills in their real business activities. The fifth stage was evaluation, which assessed changes in production capacity and business management capacity after the intervention.

Program Activities

The program activities focused on two main empowerment aspects: production capacity and business management capacity. The production aspect was addressed through hygienic production training, the introduction of appropriate production technologies, and the use of hygiene equipment. The business management aspect was addressed through digital bookkeeping training, cash-flow discussion, simple financial record practice, and business planning assistance.

Table 1. Program Activities and Empowerment Indicators

Program Activity	Empowerment Aspect	Main Intervention	Expected Output
Needs assessment and program socialization	Production and business management	Field observation, informal interviews, and group discussion	Priority problems identified
Hygienic production training	Production	Introduction to food hygiene, work safety, and simple production standards	Improved awareness of hygienic production
Appropriate technology implementation	Production	Banana slicing machine and oil spinner	Faster and more consistent production
Hygiene practice strengthening	Production	Masks, gloves, aprons, and head covers	Safer and more hygienic production

Program Activity	Empowerment Aspect	Main Intervention	Expected Output
Digital bookkeeping training	Business management	BukuWarung or simple bookkeeping application	Improved income and expense recording
Cash-flow and business planning mentoring	Business management	Simple cash-flow discussion, business planning template, and financing readiness	Documented simple business plan and improved financial discipline

The production intervention included the use of a banana slicing machine to improve slice uniformity and an oil spinner to reduce oil content after frying. The partners were also provided with hygiene equipment, including masks, gloves, aprons, and head covers, to support cleaner food-processing practices. These tools were categorized as appropriate production technologies because they directly addressed the partners' operational problems and were relatively easy to adopt in household-based production. Appropriate technology is relevant for empowerment when it fits local needs, user capability, affordability, and sustainability requirements (Patnaik & Tarei, 2022; Shin et al., 2019).

The business management intervention focused on digital bookkeeping. Partners were introduced to basic financial recording, including the separation of income and expenses, cash-flow monitoring, and simple profit calculation. The training used a simple bookkeeping application to help partners record daily transactions more consistently. This component was important because digital financial recording can support financial literacy, improve business decision-making, and strengthen readiness for external financing (Al-shami et al., 2024; Diptyana et al., 2022).

Evaluation Indicators

The program evaluation used descriptive indicators to compare partner conditions before and after the intervention. The indicators were developed based on the two empowerment aspects addressed in the program: production capacity and business management capacity. This descriptive evaluation model was considered appropriate because the program involved a relatively small number of partners and aimed to document practical changes in community-based business practices rather than to produce statistical generalization.

Table 2. Evaluation Indicators of MSME Empowerment

Indicator	Empowerment Aspect	Measurement Focus	Data Source
Production efficiency	Production	Reduction in production time after technology implementation	Observation and partner report
Product consistency	Production	Uniformity of slices, texture, and quality	Observation and production documentation

Indicator	Empower-ment Aspect	Measurement Fo-cus	Data Source
Hygienic production practice	Production	Use of masks, gloves, aprons, and head covers during production	Observation checklist and photos
Appropriate technology use	Production	Ability to operate the slicing machine and oil spinner	Practice obser-vation
Digital bookkeeping adop-tion	Business management	Use of digital appli-cation to record income and expenses	Application record and mentoring notes
Cash-flow understanding	Business management	Ability to distin-guish revenue, costs, and profit	Question-and-answer session
Simple busi-ness planning	Business management	Availability of doc-umented basic business plan	Business plan document

The empowerment level was assessed using a simple descriptive scoring scale ranging from 1 to 5. The score was determined based on observation, partner practice during mentoring, documentation records, and reflective discussion with participants. This scoring was used to describe observable changes in partners' practices before and after the intervention. It was not intended to measure causal effects statistically, but to provide a practical evaluation of capacity improvement in a community service context.

Although the descriptive scoring scale ranged from 1 to 5, an intermediate score was used when an indicator reflected a condition between two adjacent categories. For example, a score of 2.5 indicated that the observed condition was between low and moderate. In this program, the pre-program score of 2.5 for product consistency showed that the partners had partially consistent products, but variations in slice thickness, texture, and crispness were still frequently observed. Therefore, the score was used de-scriptively to represent a transitional condition rather than a statistical measurement.

Table 3. Descriptive Scoring Scale for Empowerment Evaluation

Score	Category	Interpretation
1	Very low	The capacity was not yet practiced or was still highly limited.
2	Low	The capacity was practiced occasionally but remained inconsistent.
3	Moderate	The capacity was partially practiced but still required assistance.
4	Medium-high	The capacity was frequently practiced with limited assistance.

Score	Category	Interpretation
5	High	The capacity was consistently practiced and could be applied independently.

Source: Developed by the authors for descriptive evaluation of MSME empowerment changes before and after the community service program.

Data Collection and Analysis

Data were collected using four techniques: observation, documentation, partner participation records, and reflective discussion. Observation was conducted during needs assessment, production training, technology implementation, and bookkeeping practice. Documentation included photos of program activities, production equipment use, hygiene practice, and bookkeeping exercises. Participation records were used to capture partner involvement in training and mentoring activities. Reflective discussion was conducted to understand partner responses, difficulties, perceived benefits, and follow-up needs after the intervention.

Production efficiency was assessed descriptively by comparing the time required for key production activities before and after the introduction of the banana slicing machine and oil spinner. The comparison focused mainly on slicing preparation and post-frying oil reduction, which were identified as the main production bottlenecks during the needs assessment. The estimated efficiency improvement of up to 30% was derived from field observation during production practice and confirmed through partner reports during mentoring and reflective discussion. Therefore, the percentage was used as a descriptive program outcome rather than as a statistically tested effect.

The data were analyzed descriptively by comparing the initial condition of partners with the observed changes after the program. The analysis focused on practical outcomes rather than statistical generalization. This approach is suitable for community service programs that aim to assess observable changes in partner capacity, especially when the number of participants is limited and the intervention is context-specific.

The analysis was organized into two categories. First, production empowerment was assessed through improvements in efficiency, product consistency, hygienic practices, and the use of appropriate production technologies. Second, business management empowerment was assessed through the adoption of digital bookkeeping, improved understanding of cash flow, and the preparation of simple business planning documents. The results were then interpreted to explain how the integration of appropriate production technologies and digital bookkeeping contributed to strengthening banana chips MSME empowerment in Pamijahan Village.

RESULTS AND DISCUSSION

Initial Condition of Banana Chips MSMEs

The initial assessment showed that the partner group had strong economic potential but still faced fundamental limitations in production and business management. The group consisted of 19 women MSME actors who had produced banana chips for more than five years using household-based and traditional production practices. The production process still relied on manual slicing tools and simple frying equipment, resulting in uneven slice thickness, inconsistent texture, and variation in product crispness. In addition, hygienic production practices had not been fully standardized, as the use of masks, gloves, aprons, and head covers was not yet part of the partners' daily production routine.

From the business management perspective, the partners had not yet maintained structured financial records. Income and expenses were still managed informally, and the separation between household finance and business finance was not clearly documented. This condition made it difficult for partners to calculate profit, monitor cash flow, plan production cycles, and prepare administrative documents for external financing. Similar challenges are commonly found among rural and household-based MSMEs, where limited financial literacy and weak record-keeping practices can constrain business growth and financing readiness (Adomako et al., 2016; Al-shami et al., 2024; Diptyana et al., 2022).

Figure 1. Initial Discussion and Needs Assessment with Banana Chips MSMEs in Pamijahan Village

The participatory discussion also confirmed that the partners required practical interventions rather than abstract entrepreneurship training. Their immediate needs were related to more efficient slicing, better oil reduction, cleaner production practices, and simple financial recording tools. Therefore, the community service program focused on two foundational empowerment aspects: production capacity and business management capacity.

Implementation of Appropriate Production Technologies

The first intervention focused on strengthening production capacity through hygienic production training and the implementation of appropriate production technologies. The technologies introduced to the partners included a banana slicing machine, an oil spinner, and hygiene equipment such as masks, gloves, aprons, and head covers. These tools were selected because they were directly related to the partners' operational problems and could be integrated into their existing household-based production process.

The banana slicing machine was introduced to reduce manual slicing time and improve slice uniformity. Before the intervention, slicing was conducted manually, which caused variations in thickness and affected the final texture of the chips. After the intervention, partners were able to produce more uniform slices, making the frying process more consistent. The oil spinner was introduced to reduce excess oil after frying, improve product crispness, and support longer shelf life. Program documentation indicates that the use of production technology contributed to an estimated improvement of up to 30% in production efficiency. This improvement was mainly observed in the reduction of time required for banana slicing and post-frying oil reduction after the partners used the slicing machine and oil spinner. The intervention also helped produce banana chips with more uniform slices, crispier texture, and better oil reduction.

Table 4. Production Technology Interventions and Observed Changes

Production Intervention	Initial Problem	Program Action	Observed Change
Banana slicing machine	Manual slicing was slow and uneven	Hands-on training and machine implementation	More uniform slices and faster preparation
Oil spinner	Excess oil affected crispness and shelf life	Training on spinner operation	Crispier product and improved oil reduction
Hygiene equipment	Limited use of personal protective equipment	Use of masks, gloves, aprons, and head covers	Cleaner and more hygienic production process
Simple production standardization	No consistent production routine	Introduction of basic production procedures	More consistent production practice

The adoption of these technologies reflects the relevance of appropriate technology in rural MSME empowerment. Appropriate technology is not merely defined by technological sophistication, but by its suitability to local needs, user capability, affordability, and sustainability (Patnaik & Tarei, 2022; Shin et al., 2019). In the context of Pamijahan banana chips MSMEs, the slicing machine and oil spinner were appropriate because they directly responded to everyday production problems and could be operated by the partners after practical training.

Figure 2. Implementation of Appropriate Production Technologies

Strengthening Digital Bookkeeping Practices

The second intervention focused on business management capacity through digital bookkeeping training and simple cash-flow mentoring. The partners were introduced to basic financial recording, including how to record daily income, production costs, sales revenue, and profit. The training used a simple digital bookkeeping application to make the recording process easier and more accessible through smartphones.

Before the program, most partners did not have structured bookkeeping practices. Transactions were remembered informally or mixed with household financial activities. After training and mentoring, the partners began to understand the importance of separating business income and expenses, recording daily transactions, and using financial records as a basis for evaluating business performance. Program documentation shows that 15 out of 19 partners, or approximately 84%, began using digital financial recording, and some partners prepared documents for Kredit Usaha Rakyat (KUR) as part of business capital strengthening.

Table 5. Digital Bookkeeping and Business Management Interventions

Business Management Intervention	Initial Problem	Program Action	Observed Change
Digital bookkeeping	No structured financial records	Training on bookkeeping application	Partners began recording income and expenses digitally
Cash-flow literacy	Limited understanding of cash inflow and outflow	Simple financial literacy training	Partners understood income, costs, and profit more clearly
Simple business planning	No documented business plan	Mentoring using a simple business plan template	Partners prepared basic business plans
Financing readiness	Limited access to formal funding	Introduction to KUR and document preparation	Some partners prepared financing documents

This result supports previous studies emphasizing the importance of financial literacy and digital financial literacy for MSME performance. Financial literacy enables small business actors to make better decisions regarding cost control, financing, and business growth (Adomako et al., 2016; Goyal & Kumar, 2021). Digital financial literacy further strengthens this capacity by helping MSMEs use digital tools to improve financial inclusion, business decision-making, and access to formal financial services (Al-shami et al., 2024; Kurniasari et al., 2023).

Descriptive Evaluation of MSME Empowerment Level

The descriptive evaluation showed that the program improved partner capacity in both production and business management aspects. The improvement was not only reflected in knowledge acquisition, but also in observable changes in daily business practices. Partners became more familiar with production equipment, adopted hygiene equipment during production, and began to use digital bookkeeping tools for transaction recording.

Table 6. Descriptive Evaluation of Empowerment Level Before and After the Program

Empowerment Indicator	Before Program	After Program	Main Improvement
Production efficiency	Low	Medium-high	Slicing and oil-reduction time decreased by up to 30%
Product consistency	Low-moderate	High	Product slices and texture became more uniform
Hygienic production practice	Low	High	Partners used hygiene equipment during production
Appropriate technology use	Very low	Medium-high	Partners operated slicing machine and oil spinner
Digital bookkeeping adoption	Very low	Medium-high	15 out of 19 partners, or approximately 79%, used digital bookkeeping
Cash-flow understanding	Low	Medium-high	Partners understood income, expenses, and profit more clearly
Simple business planning	Low	Medium-high	Business plans were documented

The results indicate that appropriate production technologies and digital bookkeeping functioned as complementary empowerment instruments. Production technologies improved operational capacity, while digital bookkeeping strengthened managerial capacity. The program also showed that partner empowerment increased in two fundamental aspects: more efficient, hygienic, and consistent production, and more structured business management through digital financial recording and simple business planning.

The score of 2.5 for pre-program product consistency in Figure 3 represents an intermediate condition between low and moderate. This score indicates that the partners had shown partial consistency in production outcomes before the intervention, but variations in slice thickness, texture, and crispness were still frequently observed. Therefore, the intermediate score was used descriptively to represent a transitional condition rather than a statistical measurement.

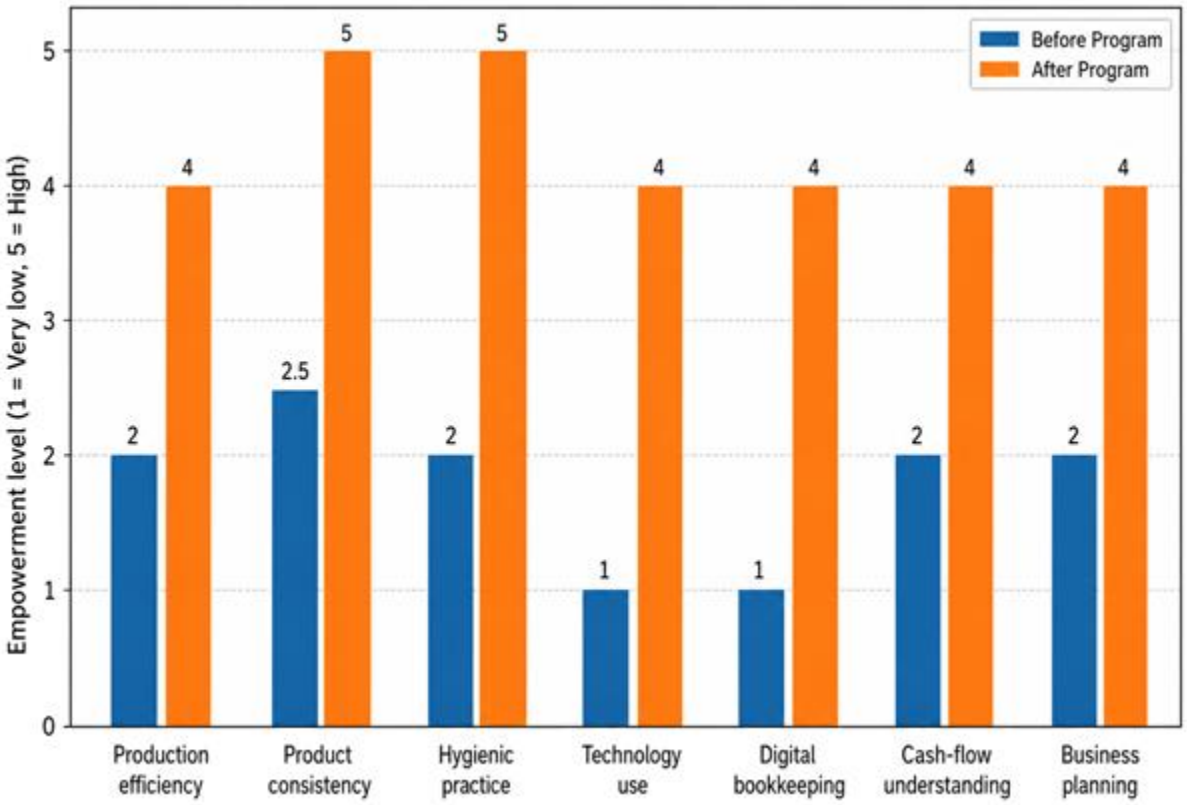

Figure 3. Changes in MSME Empowerment Level Before and After the Program

The findings are consistent with the logic of practice-based community service interventions. Previous studies on participatory community empowerment emphasize that community service programs tend to be more effective when they combine participatory needs assessment, hands-on training, continuous mentoring, and descriptive evaluation of observable changes before and after the program (Israel et al., 2022; Minkler & Wallerstein, 2021). In the present program, observable changes occurred because the partners did not only receive information, but also practiced the use of production tools, applied hygiene equipment, and tried digital bookkeeping in their own business context.

Discussion

Appropriate Production Technologies and Production Empowerment

The improvement in production efficiency and product consistency demonstrates that appropriate production technologies can become an effective driver of MSME empowerment. The slicing machine and oil spinner addressed practical production bottlenecks that had previously limited the partners' ability to produce banana chips efficiently and consistently. This finding supports the argument that appropriate technology should be evaluated based on its contextual fit, usability, and capacity to solve local problems (Patnaik & Tarei, 2022; Shin et al., 2019).

In this program, the technologies introduced were not complex industrial machines, but practical tools that could be operated within a household-based production setting. This characteristic is important because rural MSMEs often require technology that is easy to maintain, affordable, and compatible with existing production routines. The adoption of these technologies also encouraged partners to move from informal production practices toward a more standardized work process.

The use of hygiene equipment also contributed to production empowerment. By using masks, gloves, aprons, and head covers, partners began to internalize basic food hygiene practices. This shift is important for food-based MSMEs because product quality is not determined only by taste and texture, but also by cleanliness and consumer trust. Therefore, production empowerment in this program included both technical efficiency and behavioral change in production discipline.

Digital Bookkeeping as a Foundation for Business Management Empowerment

The adoption of digital bookkeeping strengthened the partners' ability to manage their businesses more systematically. Before the intervention, financial records were not documented clearly, making it difficult for partners to determine whether the business was profitable or merely generating cash turnover. After the intervention, partners began to record transactions digitally and understand the distinction between income, expenses, and profit.

This finding reinforces the importance of financial literacy for MSME development. Financial literacy supports better business planning, improves access to finance, and helps entrepreneurs make more informed decisions (Adomako et al., 2016; Diptyana et al., 2022). In the digital context, financial recording applications can simplify bookkeeping practices and help microbusiness actors build more disciplined financial routines (Al-shami et al., 2024; Diptyana et al., 2022).

Digital bookkeeping also contributes to financing readiness. The preparation of simple business plans and KUR-related documents shows that the intervention helped partners move toward more formal business management. Although the program did not yet conduct a long-term evaluation of financing outcomes, the partners' ability to prepare basic financial documents represents an important step toward stronger business independence.

Participatory Mentoring and Women-led MSME Empowerment

The results also show that the success of the program was strongly related to participatory mentoring. Partners were involved in identifying problems, practicing new technologies, and reflecting on business management needs. This approach aligns with community-based empowerment principles, which emphasize active participation, shared learning, and local ownership (Israel et al., 2022; Minkler & Wallerstein, 2021).

The empowerment dimension is particularly important because the partner group consisted of women MSME actors. For women-led household enterprises, capacity building in production and financial management can strengthen not only business performance, but also household economic resilience. When women MSME actors are able to operate production equipment, record transactions, and prepare business plans, they gain stronger control over productive resources and business decision-making.

The findings are also consistent with practice-oriented community empowerment models, where training becomes more effective when followed by direct practice, contextual assistance, and continuous mentoring. Prior studies on community-based participatory approaches emphasize that capacity-building programs are more likely to generate sustainable behavioral change when participants are actively involved in problem identification, skill application, reflection, and follow-up support (Israel et al., 2022; Minkler & Wallerstein, 2021). Similarly, the present program indicates that women-led banana chips MSMEs can improve their empowerment level when practical technology transfer is combined with digital bookkeeping mentoring.

3.6 Summary of Results and Discussion

Overall, the program contributed to the strengthening of banana chips MSMEs in Pamijahan Village through two complementary pathways. First, appropriate production technologies improved production efficiency, product consistency, and hygienic practices. Second, digital bookkeeping improved financial recording discipline, cash-flow understanding, and business planning readiness. These findings suggest that rural MSME empowerment requires not only market-oriented interventions such as branding and digital marketing, but also foundational capacity building in production and business management.

For food-based MSMEs, production readiness and financial discipline are essential prerequisites for sustainable business development. Without consistent product quality and clear financial records, market expansion may not be supported by adequate operational and managerial capacity. Therefore, the integration of appropriate production technologies and digital bookkeeping provides a relevant model for strengthening women-led MSMEs in rural food-processing sectors.

The comparison of conditions before and after the program is presented in Table 1.

Aspect	Before	After
Marketing method	Conventional (offline)	Digital (social media)

Market reach	Limited local area	Wider (regional/national)
Marketing content	Unstructured	Planned and consistent
Product branding	Not prioritized	Improved and strengthened
Use of social media	Minimal	Active and well-managed

Based on Table 1, the program had a tangible impact on improving participants' marketing practices. The transition from conventional to digital-based marketing reflects the increasing adaptability of MSMEs to technological advancements. This finding is consistent with the notion that digital marketing enhances marketing effectiveness and expands market reach (Chaffey & Ellis-Chadwick, 2019). Furthermore, improvements in branding indicate that participants began to understand the importance of product differentiation in creating customer value. Strong branding plays a crucial role in building consumer trust and strengthening competitive advantage in the market (Kotler & Keller, 2016).

From a business perspective, the enhancement of marketing capability provides greater opportunities for MSMEs to improve performance, particularly in terms of sales growth and market expansion. Marketing capability has been widely recognized as a key driver of business performance and competitive advantage (Morgan et al., 2009). Therefore, digital-based mentoring not only improves technical marketing skills but also supports a broader transformation of MSME marketing strategies toward more adaptive and sustainable practice:

CONSLUSION

This community service program demonstrated that the empowerment level of banana chips MSMEs in Pamijahan Village can be strengthened through the integration of appropriate production technologies and digital bookkeeping. The implementation of a banana slicing machine, oil spinner, and hygiene equipment contributed to more efficient, consistent, and hygienic production practices. The program also encouraged partners to shift from fully manual production routines toward more standardized work processes that support product quality and business sustainability.

In the business management aspect, digital bookkeeping training helped partners begin recording income, expenses, and cash flow more systematically. The adoption of simple digital financial recording practices enabled partners to better understand business transactions, distinguish between revenue and costs, and prepare basic business planning documents. These changes indicate that digital bookkeeping can serve as an important foundation for improving financial discipline and financing readiness among household-based MSMEs.

The findings suggest that MSME empowerment should not only focus on market expansion, branding, or digital promotion, but also on strengthening foundational business capacities. For food-based MSMEs, production efficiency, product consistency, hygiene practices, and financial recording discipline are essential prerequisites for sustainable growth. Therefore, the combination of appropriate production technologies and digital bookkeeping can be viewed as a practical empowerment model for women-led food MSMEs in rural communities.

This program also has several limitations. The number of participants was relatively small, the evaluation relied on descriptive indicators, and the long-term consistency of digital bookkeeping and technology use still requires further monitoring. Future community service programs should expand the intervention into packaging standardization, product legality, branding, digital marketing, marketplace access, and long-term financial mentoring. In addition, future evaluations may apply a more structured pre-test and post-test design to measure changes in partner capacity more rigorously..

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