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Smart Technology Based Modernization to Maximize the Potential of Fried Shallot MSMEs

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ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) play a pivotal role in Indonesia's economy, particularly in the high-value fried shallot agro-industry. However, many MSMEs, such as Piknik Food, encounter persistent challenges in production and management due to manual practices, leading to limited capacity (15 packs/day), inconsistent product quality, and restricted market reach. This community engagement program employed a participatory-collaborative approach through stages: socialization, training, technology adoption, mentoring, and sustainability. Interventions emphasized smart technology-based modernization, including the application of production machinery (peeler, spinner, continuous sealer), financial digitalization, and the implementation of digital marketing strategies via social media and e-commerce platforms. The results indicated a 90% increase in production capacity (28–30 packs/day), a 32–35% reduction in oil content approaching SNI standards, improved hygienic packaging, and approximately 20% market expansion. These findings underscore that smart technology-based modernization enhances productivity, product quality, and competitiveness while supporting the achievement of the Sustainable Development Goals.

Keywords: *MSMEs, Fried Shallot, Smart Technology, Modernization, Digitalization*

1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a strategic role in national economic development. Data from the Coordinating Ministry for Economic Affairs show that MSMEs account for 99% of total business units, contribute 60.5% to Gross Domestic Product (GDP), and absorb 96.9% of the national workforce **(ekon.go.id, 2022)**. One of the important subsectors of MSMEs is the agro-industry, particularly horticulture **(Putra et al., 2018).** Shallots are among the leading commodities with high economic value and promising export potential **(Husman et al., 2022)**. In 2023, shallot production in Indonesia reached 1.9 million tons, with Central Java as one of the main production centers, including Banyumas Regency which contributed 148 tons **(BPS, 2023)**.

This high productivity must be balanced with appropriate post-harvest technology to prevent crop deterioration and to provide greater economic value **(Mamonto et al., 2024)**. One popular derivative product is fried shallots, which have a higher selling price and growing market demand **(Bahtiar et al., 2022)**; **(Yudiono et al., 2024)**. However, despite this potential, MSMEs engaged in fried shallot processing continue to face challenges in production, management, and marketing.

A real example is Piknik Food MSME, located in East Purwokerto, Banyumas Regency. Although operating for more than five years with fried shallots and packaged chili paste as its main products, its production capacity remains limited to around 15 packs per day, far below market demand of 30 packs. The production process is fully manual, from peeling, slicing, frying, to oil draining. This condition leads to inefficiency, worker fatigue, and inconsistent product quality. In addition, the high oil content causes products to turn rancid quickly, falling short of food quality standards **(SNI 7713:2013) (Syaifatul et al., 2024)**.

Other challenges arise in the area of business management. Financial records are still kept manually, making it difficult for owners to monitor cash flow, profit and loss, or plan long-term strategies **(Rizkita et al., 2025)**. In terms of marketing, the strategy remains basic, limited to traditional markets, with unattractive packaging that fails to meet modern retail standards. The absence of social media and e-commerce utilization further restricts market reach.

Considering these conditions, this community empowerment program focuses on production modernization through smart technology and digitalization of business management. Technological modernization includes the use of an automatic spinner machine to reduce oil content **(Syaifatul et al., 2024)**, a peeling machine to accelerate initial processing **(Afrini et al., 2024)**, and a continuous sealer for hygienic, airtight packaging **(Ari et al., 2023)**. Meanwhile, business management digitalization emphasizes application-based financial recording and the use of social media and e-commerce platforms to expand market access **(Harmanto et al., 2024)**; **(Elfiana et al., 2023)**.

The selection of Piknik Food MSME as the program partner is based on its representativeness as a micro-scale agro-industry facing technological, managerial, and marketing limitations, while also holding strong potential for development. Located in East Purwokerto, the business employs seven workers, most of whom are housewives. Thus, empowering this MSME will have a direct impact on household welfare and the surrounding community **(Cahyaningrum et al., 2019)**.

The goal of this program is not only to increase production capacity and product quality, but also to foster socio-economic transformation through MSME competitiveness, job creation, and digital literacy strengthening. This effort is aligned with the achievement of the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure). Therefore, MSME modernization through smart technology and digital business management serves as a strategic step to strengthen local economic resilience while promoting sustainable MSME transformation.

2. METHOD

MSME Piknik Food, located in East Purwokerto, Banyumas Regency, is a microenterprise in the agro-industry sector that produces fried shallots and packaged chili sauce, employing seven local workers, most of whom are housewives. The partner was selected because it faces challenges in production, management, and marketing, thus requiring interventions in the form

of appropriate technology and business digitalization. The service location is considered strategic since Banyumas is one of the horticultural production centers, particularly for shallots **(BPS, 2023)**. The program was implemented using a participatory-collaborative approach, in which the partner played an active role from problem identification, training on the operation of production machinery and business digitalization, to evaluation and the formulation of sustainability strategies. This approach aligns with the concept of community development, which emphasizes active community participation **(Mardikanto & Soebianto, 2015)**. The method applied was Participatory Action Research (PAR), involving stages of planning, action, observation, and reflection carried out jointly with the community **(Setyawan et al., 2018)**. This strategy was chosen to encourage knowledge transfer, foster partner independence through learning by doing, and ensure program sustainability as solutions are derived from the partner's actual needs.

The stages of the Community Service Program implementation for the Piknik Food MSME are illustrated in the following flowchart (figure 1):

Figure 1. The Stages of The Community Service Program

1. Program Socialization
Socialization is conducted to align perceptions and explain the objectives, benefits, and mechanisms of the program. Face-to-face meetings are held at the partner's business location to build mutual commitment, reduce resistance to change, and ensure active partner participation **(Mardikanto & Soebianto, 2015).**

2. Training
The training covers two main aspects. Production aspect, partners are introduced to and trained in using a peeler machine, smart oil-draining spinner, and continuous sealer machine for hygienic packaging. Each session includes basic maintenance and troubleshooting, using a learning by doing approach to facilitate mastery of technical skills **(Setyawan et al., 2018)**. Business management aspect, includes digital financial recording, raw material stock management, and simple report preparation to improve financial literacy and operational efficiency **(Ministry of Cooperatives and MSMEs, Indonesia, 2023).**

3. Technology Implementation
The team carries out the handover and installation of appropriate technology suitable for MSME scale. This includes the peeler machine, automatic spinner with temperature sensor and timer, and continuous sealer. Additionally, digital financial recording applications are installed and configured. Partners are also guided in creating promotional content and managing social media accounts to support marketing efforts **(Kholis et al., 2024)**.

4. Assistance
Assistance is carried out regularly through production monitoring, product quality control, and continuous technical guidance. This stage ensures that partners are able to operate the introduced technologies effectively while maintaining consistent product standards **(Kholis et al., 2024).**

5. Evaluation
Evaluation is conducted to measure the effectiveness of the interventions. It focuses on monitoring improvements in production capacity, product quality, operational efficiency,

financial recording practices, and digital marketing activities (Directorate General of Higher Education, 2022).

3. RESULT AND DISCUSSION

The community service program at UMKM Piknik Food was implemented in stages, actively involving partners, and focused on addressing key challenges in production, business management, and marketing. Each stage demonstrated significant achievements that supported the improvement of business performance.

1. Program Socialization

The socialization stage proceeded smoothly, as indicated by the high level of participation from the owner and employees of Piknik Food MSME. Through face-to-face meetings, the implementation team successfully conveyed the objectives, benefits, and implementation plan of the program. The partners demonstrated strong commitment by preparing the venue and allocating time to participate in the entire series of activities. This aligns with the findings of **(Mardikanto & Soebianto, 2015)**, which emphasize that initial mutual understanding between the implementation team and partners is crucial for the success of MSME mentoring programs.

2. Training

The training covered three main aspects: production, business management, and marketing. In the production aspect, partners received technical knowledge on using a peeler machine to accelerate the processing of raw materials, a smart oil-draining spinner to produce fried shallots with lower oil content, and a continuous sealer machine to improve packaging quality, making it more hygienic, tightly sealed, and compliant with modern market standards. Observations indicated that employees were able to operate the machines independently after demonstration sessions and hands-on practice. In the business management aspect, training on digital financial recording was successfully implemented. Partners were able to input daily transactions, prepare weekly and monthly reports, and calculate basic profit and loss. These findings reinforce the study by **(Panduwinata et al., 2025)**, which highlights that digitalization of financial records in MSMEs can enhance transparency and accuracy in business management. In the marketing aspect, training was provided on product rebranding, including logo redesign and the development of more informative and visually appealing packaging to meet modern market standards. In addition, digital marketing training covered social media and e-commerce based promotional strategies, creative content creation, and techniques to increase consumer engagement. This approach aims to expand market reach and enhance the partner's competitiveness in the digital era. Figure 2 shows the main training activities:

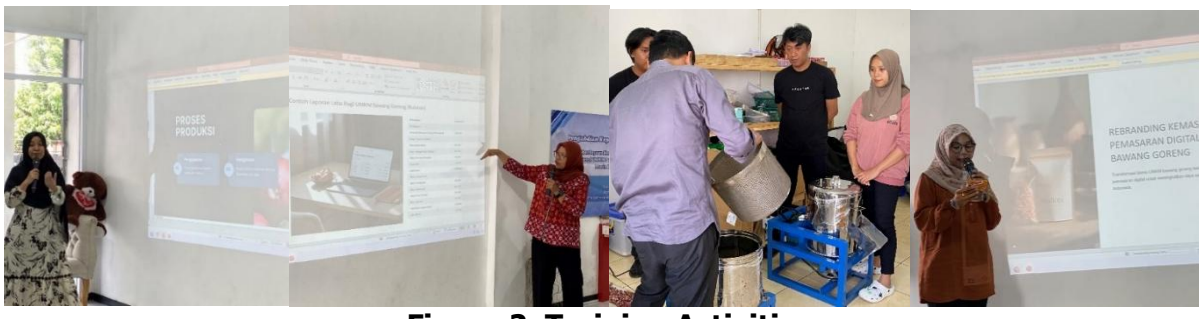

Figure 2. Training Activities

3. Technology Implementation

The technology implementation focused on the use of production machinery and digital systems to support improved efficiency and modern business practices. The technologies introduced included a peeler machine, a spinner machine for oil reduction, and a continuous sealer machine to enhance packaging quality. In addition, a digital financial recording application was utilized to assist partners in preparing more structured financial reports. The program also integrated digital marketing strategies through promotional content creation and social media activation, aimed at strengthening business visibility and competitiveness, particularly through e-commerce platforms. The technology implementation activities are as follows (figure 3):

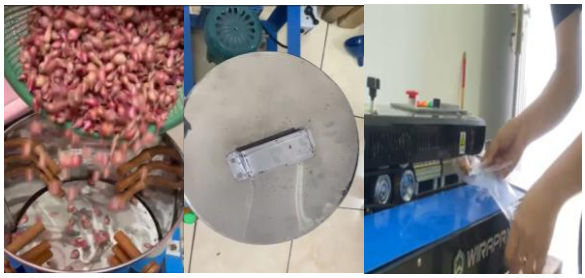

Figure 3. Application of Technology

4. Assistance

Assistance was carried out regularly through weekly visits to ensure that all implementations were executed according to plan. This assistance not only provided technical guidance but also strengthened the partner's capacity to meet quality, legality, and marketing standards, making the MSME's products more competitive in broader markets. The assistance activities included:

a. Monitoring the use of production machines (peeler, spinner, and continuous sealer)

The team conducted direct supervision of machine usage to ensure that the partner could operate them properly. Monitoring also covered checking the production output to ensure it met the established standards. The activities are as follows (figure 4):

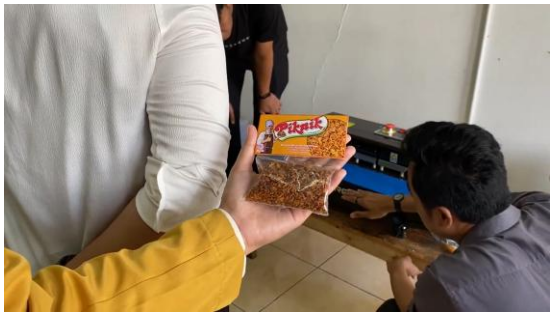

Figure 4. Monitoring The Use Of Production Machines

b. Technical guidance on machine maintenance and troubleshooting

The partner was provided with guidance on machine care to ensure durability and optimal performance, including routine cleaning and component checks. In addition, simple troubleshooting simulations were conducted so that the partner could independently handle minor technical issues.

c. Assistance in digital financial recording

The partner was trained to input daily transactions, prepare weekly and monthly reports, and calculate simple profit-and-loss statements using a digital accounting application. This assistance aimed to make financial administration more organized and transparent.

d. Support in promotional content creation and activation of social media and e-commerce accounts

The team assisted in creating product photos and videos, preparing promotional narratives, and managing social media accounts. Online store activation on e-commerce platforms was also carried out to expand the partner's digital market reach. The activities are as follows (figure 5):

Figure 5. Support In Promotional Content Creation

e. Socialization of halal certification procedures, document preparation assistance, and internal audit simulation in accordance with BPJPH regulations

The team provided explanations of halal certification procedures based on BPJPH requirements, assisted in preparing the necessary documents, and conducted internal halal audit simulations. This step ensured that the partner was better prepared for the official certification process, thereby increasing consumer trust and opening opportunities to enter modern retail markets. The activities are as follows (figure 6):

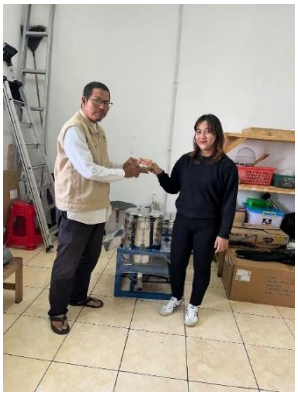

Figure 6. Assistance In Making Halal Certification

5. Evaluation

Evaluation was conducted to assess the effectiveness of the interventions through both quantitative and qualitative indicators. The results demonstrated significant improvements across various aspects of the business, supported by measurable data and partner feedback.

a. Production Performance
Production capacity increased by approximately 90%, from around 15 packs per day before the intervention to 28–30 packs per day after. The average daily working hours remained constant (6–7 hours), indicating a significant improvement in productivity per labor hour by nearly 85%.

Table 1. Production Performance Improvement

Indicator	Before Intervention	After Intervention	Change (%)
Average Output (packs/day)	15	29	+90%
Processing Time (minutes/batch)	60	18	-70%
Machine Usage (hours/day)	–	5	–
Oil Content (%)	40–42	26–28	-32%

The introduction of the peeler and spinner machines played a critical role in achieving these improvements, allowing each batch to be processed in only 18 minutes, compared to 60 minutes previously. These changes led to a higher production turnover and improved product consistency, confirming the positive influence of technology adoption described by **(Riyanto et al., 2022)**.

b. Product Quality Enhancement
Product quality also improved substantially. The oil content reduction from over 40% to 26–28% contributed to:
- A 30–40% longer shelf life (extending from an average of 7 days to 10–12 days).
- Improved texture crispness and color uniformity
- Decrease in product returns due to rancidity from 8% to less than 2% per month.

These outcomes align with **(Putri et al., 2021),** who emphasized that reducing oil content is a critical parameter for food product acceptance and market expansion.

c. Branding and Packaging Development
Prior to the intervention, packaging used plain plastic wraps with handwritten labels. After rebranding, modern resealable packaging was introduced (figure 7) featuring:
- A new Piknik Food logo and nutritional information,
- Food-grade packaging certified under SNI 8333:2016 standards.

Sales data indicated that customer appeal and repeat orders increased by 32% within two months after packaging redesign, proving that branding revitalization significantly influences consumer trust.

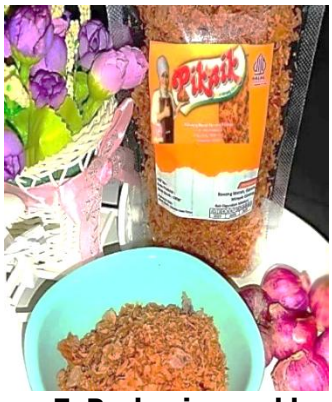

Figure 7. Packaging and branding

d. Financial Management
Financial transparency improved drastically. The partner transitioned from manual notes to the digital accounting app, enabling:
- Weekly and monthly financial reports,
- Automatic profit-loss statement generation, and
- Tracking of cash flow, raw material usage, and revenue growth.

Within two months, recorded net profit margins increased by 10%, from 12% to 13.2%, primarily due to reduced waste and better cost control. This finding corroborates **(Panduwinata et al., 2025)**, who asserted that MSMEs utilizing digital accounting tools show higher accountability and informed decision-making.

e. Marketing and Digital Presence
Marketing transformation was also notable. Before the program, Piknik Food relied solely on offline local sales. After digital marketing training, the MSME:
- Created Instagram pages,
- Opened Shopee stores, and
- Implemented weekly content updates with product photos and customer testimonials.

Monthly sales via e-commerce reached 15% of total sales, reflecting the strong impact of digitalization, in line with **(Nasution et al., 2025).**

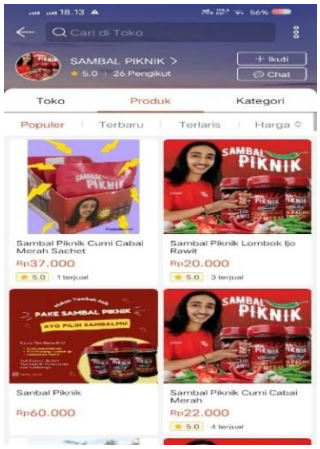

Figure 8. Digital Marketing

f. Halal Certification Progress
Before the intervention, the MSME had no awareness or documentation for halal certification. Post-intervention, the partner:
- Completed all BPJPH registration requirements,
- Conducted product and material traceability documentation, and
- Entered the verification stage with a local LPH (Lembaga Pemeriksa Halal).

This effort supports Mulyani & Heri Prasetyo (2025), who emphasized that halal certification is not only a compliance step but also a brand value enhancer, increasing consumer trust and opening access to modern retail markets.

Integrating participatory mentoring, technological modernization, digital management, and e-commerce strategies resulted in comprehensive MSME growth, as summarized in table 2.

Table 2. Summary of MSME Improvement Indicators

Area	Key Indicator	Before	After	Improvement
Production	Output/day	15 packs	29 packs	+90%
Efficiency	Peeling Time	60 min	18 min	-70%
Product Quality	Oil Content	42%	27%	-35%
Shelf Life	Duration	7 days	12 days	+40%
Financial Management	Record System	Manual	Digital (App)	+100% efficiency
Marketing	Online Presence	None	2 active platforms	+80% reach
Certification	Halal Status	Not Registered	BPJPH Registered	Progress achieved

These results validate the innovation-driven growth perspective of **(Schumpeter, 1942),** wherein innovation—both technological and managerial—acts as the principal driver of business competitiveness. The adoption of modern production tools, financial digitalization, and digital marketing collectively demonstrate that MSMEs engaging in continuous innovation outperform their non-innovative counterparts in sustainability, efficiency, and market access.

4. CONCLUSIONS

The community service program implemented at Piknik Food MSME has proven effective in addressing key challenges related to production, management, and marketing. The integration of participatory approaches, smart production technology, and digital business management has resulted in measurable improvements, including a 90% increase in production capacity, a 70% reduction in processing time, significant enhancement in product quality through lower oil content, and modernized packaging that meets market standards.

Business management practices shifted from manual, irregular bookkeeping to structured digital financial systems, enabling transparent and accurate reporting. Marketing strategies also transformed, with the partner adopting social media and e-commerce platforms that expanded market reach and strengthened customer engagement. Furthermore, the successful registration for halal certification not only ensures legal compliance but also enhances consumer trust and market opportunities.

These outcomes demonstrate that continuous mentoring and innovation adoption can significantly strengthen MSME competitiveness. The findings reinforce theories of innovation and prior research highlighting that modernization and digitalization are crucial drivers of MSME sustainability. More broadly, this initiative contributes to local economic resilience and supports the achievement of Sustainable Development Goals (SDGs), particularly in poverty reduction, decent work and economic growth, and innovation-driven industrial development.

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