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Increasing the Competitiveness of Faiz Mandiri's MSMES Through the Development of Chip Crushing Technology with a Controlled Speed System

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Abstract

Purpose: Micro, Small, and Medium Enterprises (MSMEs) play a vital role in supporting the local economy, but they still face various challenges in the production process, particularly during the manual shredding of raw materials. This community service activity aims to improve the competitiveness of Faiz Mandiri MSME through the development of chip shredding technology with a controlled system.

Method: The implementation method includes identifying partner problems, developing and implementing a shredding machine, and evaluating the equipment's performance based on shredding time, production capacity, labor utilization, and uniformity of the sliced results.

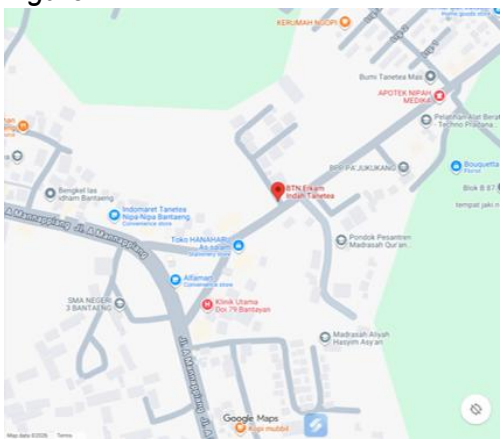
Practical Applications: The results show that the use of the shredding machine can increase the efficiency and productivity of the production process. When processing 20 kg of raw materials, the shredding time was reduced from 69 minutes to 13 minutes, with a time efficiency of 81.16%. The shredding capacity increased from 17.39 kg/hour to 92.31 kg/hour. In addition, the number of operators required was reduced from two to one. The implementation of this technology also helps produce more uniform and consistent slices, thus supporting product quality control and a smooth frying process.

Conclusion: Thus, the development of a chip chopping machine with a controlled system has the potential to be an appropriate technological solution to increase production efficiency, labor productivity, and the competitiveness of Faiz Mandiri MSMEs in a sustainable manner.

Introduction

Domestic Product (GDP) and employment. MSMEs not only drive the national economy but also serve as the backbone of local economies, drawing on the potential of regional resources. One MSME sector with significant potential is the food processing industry, particularly in the potato chip industry, which boasts stable market demand and relatively easy-to-obtain raw materials (Nurlina et al., 2021). The Faiz Mandiri MSME, a partner in this community service activity, is a chip production business that has been operating independently in Pajukukang District, Bantaeng Regency. Based on field observations and initial interviews, it was discovered that the production process is still conventional, especially at the raw material slicing stage. The slicing process is carried out manually using simple tools, resulting in uneven slice thickness. This condition impacts the quality of the final product, such as uneven levels of doneness, inconsistent texture, and less visually appealing product appearance.

Figure 1. Faiz Mandiri MSME Location



Source: Private Documentation, 2026.

Furthermore, the production process is not yet supported by appropriate technology that can increase efficiency and productivity (Andika et al., 2025). Production times are relatively long and production capacity is limited. This prevents Faiz Mandiri's MSME from consistently meeting large market demand. However, the implementation of simple, appropriate technology has been proven to improve production efficiency and product quality. In terms of food processing, the Faiz Mandiri MSME also faces limitations in implementing healthy and hygienic food processing principles. Repeated use of cooking oil, the lack of standard frying temperatures, and a lack of attention to sanitation of equipment and the production environment pose challenges to producing safe and high-quality products. On the other hand, current consumer trends indicate an increasing awareness of healthy and safe food, making this aspect crucial (Rokh Eddy Prabowo, Askar Yunianto, Muhammad Fauzan, 2024).

Photo 1. Faiz Mandiri UMKM Chip Slicing Tool



Source: Private Documentation, 2026.

One of the key pressing issues that needs to be addressed is the inconsistency of raw material slicing results. Uneven slice thickness results in suboptimal frying, resulting in

products of inconsistent quality. This directly impacts consumer satisfaction and can undermine market confidence in the products. Limited use of technology in the production process leads to low business efficiency and productivity (Imawan et al., 2025). Without technological innovation, MSMEs will struggle to increase production capacity and compete with other products that already use modern and standardized production systems. Therefore, developing a controlled chip slicing technology is a highly relevant solution for increasing efficiency while maintaining consistent product quality.

Method

The implementation approach for this community service activity uses participatory, applicable, and sustainable methods. The participatory approach is carried out by actively involving Faiz Mandiri MSMEs in every stage of the activity, from needs identification and technology design to evaluation of results. This aims to ensure that the resulting solution truly suits the conditions and problems faced by partners. The applicable approach is realized through the development and direct implementation of chip chopping technology with a controlled system that is easy to operate, efficient, and appropriate to the scale of the MSME business (Erwan Aristyanto, 2025). In addition, training and mentoring are also provided regarding the use of equipment and education on healthy chip processing that meets hygiene and product quality standards. Furthermore, a sustainable approach is carried out through regular monitoring and evaluation activities to ensure the sustainability of technology utilization and increase partner capacity (Salahudin et al., 2022). Follow-up mentoring is also provided to help MSMEs overcome technical and managerial obstacles that may arise after program implementation. With this approach, it is hoped that there will be a significant and sustainable increase in productivity, product quality, and competitiveness of Faiz Mandiri MSMEs.

Coordination with Faiz Mandiri's MSME partners is carried out intensively and continuously to ensure alignment between the community service program and the needs and real conditions in the field. Coordination activities begin with an initial meeting (kick-off meeting) aimed at aligning perceptions regarding the program's objectives, scope of activities, and the benefits to be obtained by the partners. Next, technical discussions are held with the partners to determine the specifications of the chip chopping technology with a controlled system that will be developed, so that the resulting tool is in accordance with the production capacity, type of raw materials, and operational capabilities of the partners. At this stage, the activity implementation schedule, training locations, and the division of roles between the community service team and the MSMEs are also agreed upon.

Photo 2. Initial Coordination of the PkM Team with Faiz Mandiri's MSME Partners

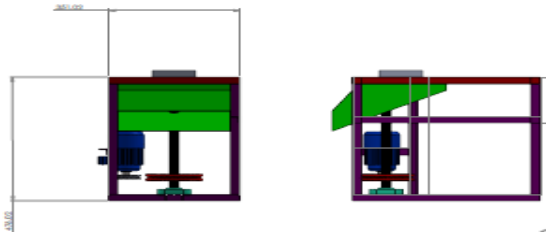


Source: Private Documentation, 2026.

The tool design stage is a crucial process in producing effective, efficient chip slicing technology that meets the needs of Faiz Mandiri's MSMEs. The design process begins with a technical requirements analysis based on field observations, including production capacity, raw material types (e.g., cassava and banana), desired slice thickness, safety aspects, and ease of operation. Next, the team designs the tool concept, taking into account the operating principles of the mechanical system and the control system to be implemented. The tool design includes key components such as the frame, cutting system, drive mechanism, and control system to regulate rotation speed and slice thickness for more uniformity (Sopiandi, 2025). This stage also involves selecting materials that are strong, durable, and safe for food

products. Once the design concept is established, detailed technical drawings and tool specifications are created as a reference during the fabrication process. The design also considers ergonomic aspects to ensure the tool is easy for operators to use and maintain. This stage concludes with a design evaluation through discussions with partners to ensure the tool's suitability to the production needs of Faiz Mandiri's MSMEs. With thorough design, the developed tool is expected to increase productivity, slice quality, and chip production efficiency (Kurniawan et al., 2024).

Picture 1. Banana Slicer Design



Source: Private Documentation, 2026.

The manufacturing stage is the process of realizing the previously designed chip chopper technology. This activity aims to produce a tool that is functional, safe, and meets the operational needs of the Faiz Mandiri MSME. The manufacturing process begins with the procurement of materials and main components, such as a steel frame, a stainless chopper blade, a drive motor, and control system components such as a speed controller and a simple control panel. Material selection is carried out by considering aspects of strength, corrosion resistance, and food safety. Next, the fabrication process is carried out, which includes cutting the material, assembling the frame, installing the mechanical system (shaft, knife holder, and transmission), and installing the drive and control systems (Paryono, L Y Sutadi, 2023). Each component is systematically assembled according to the technical drawings created during the design stage. After assembly is complete, finishing processes such as surface smoothing, checking the strength of the joints, and cleaning the tool are carried out to ensure the tool is safe and suitable for use in food product processing (Eko Saputra, Wahyu Isti Nugroho, 2025). This stage also includes an initial function test to ensure all components work properly, including rotation stability, sharpness and consistency of the slices, and control system response. If deficiencies are found, improvements are made before the tool is implemented with partners.

Photo 3. Process of Making a Chopper



Source: Private Documentation, 2026.

The trial and implementation phase is a process to ensure that the chip shredding technology with a controlled system can function optimally and meet the needs of the Faiz Mandiri MSME. This phase begins with a limited trial of the tool in a controlled environment to evaluate the tool's performance, including rotation stability, blade sharpness, uniformity of slice thickness, and the effectiveness of the control system in regulating speed and production capacity. Next, a direct operational trial is conducted at the partner's location using raw materials commonly processed by the MSME, such as cassava or bananas. At this stage, the partner is actively involved in operating the tool to ensure ease of use and suitability for working conditions in the field. The trial results are then evaluated to identify technical deficiencies or obstacles, such as tool vibration, inconsistent slice results, or problems with

the control system settings. Based on the evaluation results, improvements are made to the tool to optimize its performance and meet the partner's production needs (Salihin Ardian Pamungkas, 2021). Once the tool is declared feasible, the full implementation phase begins, namely the application of the technology in the daily production process of the Faiz Mandiri MSME. At this stage, intensive mentoring is also provided to ensure the partner is able to operate, maintain, and utilize the tool optimally. MSME owner Faiz Mandiri actively participated in the design and decision-making process during the program's implementation. Involvement was achieved through discussions regarding production needs, operational constraints, the selection of a chip crushing technology concept, and the determination of a speed control system appropriate to the partner's working conditions. The MSME owner's input and experience served as the basis for adjusting the design to ensure the technology was easy to use, effective, and suited to production needs. Thus, the implementation process was conducted in a participatory manner, giving partners a sense of ownership and readiness to operate and develop the applied technology.

Following the implementation of flake crushing technology with a speed control system, Faiz Mandiri's MSME partners demonstrated positive changes in their work patterns and utilization of production technology. Partners began to realize that controlled machine speed regulation can increase the efficiency of the flake crushing process, maintain process stability, and support occupational safety. The use of this technology also encouraged a shift in work culture from one that previously relied heavily on experience and manual operations to one that is more measured, systematic, and based on work parameters. Furthermore, partners began to be open to the application of simple technologies that can increase productivity and production quality. These changes demonstrate an increased readiness and ability of partners to adopt technology as part of efforts to continuously improve operational efficiency and MSME competitiveness.

Result

The results of the activity showed that the implementation of shredding technology has positively impacted the production process of the Faiz Mandiri MSME. The developed tool can speed up and control the shredding process compared to manual methods. The control system on the tool allows operators to regulate and control the machine's work process, resulting in a more stable shredding process (Sofyan & Sari, 2022). The results of the activity showed that the use of a shredding machine can improve partners' ability to process raw materials in the same time. With the help of the machine, the shredding process is no longer entirely dependent on the operator's hand speed. This increased capacity is particularly advantageous when MSMEs receive larger orders (Aristyanto et al., 2024). Raw materials can be processed more quickly, preventing material from piling up before entering the frying stage. The increased processing speed also allows for better production flow management. Finished shredded materials can be immediately moved to the next stage, reducing waiting times between processes (Reza Najmi Akm, James Julian, Fitri Wahyuni, 2025).

Photo 4. Chip Chopping Machine with Controlled System



Source: Private Documentation, 2026.

The use of shredding technology has an impact on the time required to complete the shredding process. While previously the process required a relatively long time due to manual processing, the use of machines allows the work to be completed in a shorter time (Purnama & Nadliroh, 2021). Reducing processing time is crucial for MSMEs because production time is directly related to production capacity. If the time required to process a single batch of raw materials can be reduced, MSMEs have the opportunity to process a larger quantity of raw materials in a single workday. Time evaluation can be done by comparing the time required to shred a specific of raw materials before and after using the machine (Lubis et al., 2021).

Table 1. Comparison Parameters of Manual Shredder with Shredding Machine

No.	Parameters	Before Implementation	After Implementation	Change
1	Amount of chopped ingredients	20 Kg	20 Kg	The same
2	Chopper time	69 Minute	13 Minute	Decrease
3	Hourly capacity	17,39 Kg/Minute	92,31 Kg/Minute	Increase
4	Number of operators	2 Person	1 Person	Reduce
5	Time efficiency	-	81,16 %	Increase

Source: Author’s Work, 2026.

The use of shredding machines also impacts labor productivity. In manual processes, most of the operator's energy is used for shredding. With the use of machines, the operator plays a greater role in preparing ingredients, feeding them into the equipment according to procedures, supervising the process, and inspecting the sliced results. Increasing the speed of the shredding process has a knock-on effect on the smoothness of the entire production process (Bisono et al., 2022). The stages of chip production consist of several interconnected activities, from raw material preparation, washing, peeling, shredding, processing or frying, draining, cooling, and packaging. Increasing the speed of shredding opens up opportunities for the Faiz Mandiri MSME to increase daily production capacity. While previously the amount of material that could be processed was limited by the length of the shredding process, the use of machines allows for an increase in the amount of material processed in a single day (Jaya Mahar Maligan, 2018). Production speed is a crucial element in increasing the competitiveness of MSMEs. MSMEs that are able to produce products with more efficient production times have the opportunity to provide better service to consumers. Increasing the speed of shredding allows the Faiz Mandiri MSME to reduce production time and increase flexibility in fulfilling orders. This can be an advantage when facing changing market demand.

Table 2. Comparison of Conditions Before and After Technology Implementation

No.	Aspect	Before Implementation	After Implementation
1	Chopping Method	Manuals	Chopper machine
2	Thickness uniformity	Relatively varied	More uniform
3	Dependence on operator skills	Tall	Lower
4	Consistency of results	Not always stable	More consistent
5	Form slices	Potentially non-uniform	More organized
6	Size control	Difficult to do consistently	Easier to control
7	Impact on frying	The degree of maturity may vary	Easier to control
8	Product display	Relatively varied	More uniform and attractive

Source: Author’s Work, 2026.

The results showed an increase in slice thickness uniformity after using the chopper. The machine's mechanical system helps maintain a more consistent cutting pattern, thus reducing variations in thickness between slices. In manual processing, differences in hand pressure, material position, cutting angle, and operator speed can result in slices of varying thickness (Pahmi, 2026). Meanwhile, using the machine allows the cutting process to proceed through a more stable mechanism. These changes demonstrate that the chopper technology

not only increases process speed but also improves the quality of the cut results.

Uniformity in the size of raw materials is one factor that supports the consistency of the final product. When fried ingredients are relatively the same size and thickness, heat transfer during frying is more uniform. This helps produce chips with a more consistent level of doneness and crispiness. The resulting product also has a more uniform appearance, giving consumers a better impression of quality. The implementation of these standards impacts product uniformity. The resulting products are more consistent in terms of size, shape, taste, texture, color, and appearance, in accordance with the product characteristics specified by the partner (Alif et al., 2025). This consistency is a crucial factor in customer retention.

Photo 5. Product Quality Consistency with Chip Chopping Machine



Source: Private Documentation, 2026.

Discussion

The implementation of community service activities at the Faiz Mandiri MSME through the application of a chip chopping machine has shown improvements in production capacity, time efficiency, labor productivity, uniformity of slice size, and consistency of product quality. The application of this technology is one effort to overcome the limitations of the manual chopping process, which previously relied heavily on operator skill and speed. The results of the activity showed that the use of the chopping machine can improve partners' ability to process raw materials in a shorter time. With the help of the machine, the chopping process is no longer entirely dependent on the operator's hand speed. This provides advantages, especially when MSMEs receive large orders because raw materials can be processed more quickly, reducing the risk of material backlogs before entering the frying stage. The increased process speed also allows for better production flow management. Raw materials that have been chopped can be immediately moved to the next processing stage, thereby reducing waiting time between processes. This condition shows that the implementation of the machine not only has an impact on one stage of production but also has the potential to improve the smoothness of the entire production flow (Dewi et al., 2024).

The use of a shredder machine significantly impacts the time required to complete the shredding process. In the manual process, production time is relatively longer because the shredding process is carried out directly by an operator. After the machine is implemented, the shredding process can be completed in a shorter time with the same of raw materials. Based on measurements, 20 kg of raw materials that previously required 69 minutes to be chopped manually can be completed in 13 minutes using the machine. Thus, hourly capacity increases from 17.39 kg/hour to 92.31 kg/minute. This comparison indicates an increase in capacity of approximately 74.92 kg/minute, or approximately 431.0% compared to the previous capacity. Meanwhile, the time required to process 20 kg of raw materials is reduced by 56 minutes. Based on these calculations, time efficiency reaches 81.16%. These results indicate that the use of the machine significantly contributes to the efficiency of the shredding process. The implementation of the shredder machine can significantly increase process productivity. In addition to reducing processing time, the number of operators required is also reduced from two to one (Salihin Ardian Pamungkas, 2021). This demonstrates that machines

can help reduce the burden of manual work while increasing labor efficiency. However, reducing the number of operators does not eliminate the role of workers in the production process. Operators still play a crucial role in preparing raw materials, operating machines according to procedures, supervising the slicing process, and inspecting the sliced products. Thus, technology serves as a tool to increase labor productivity, not simply a replacement for human labor. This increased capacity provides significant benefits for Faiz Mandiri's MSMEs, especially when facing increased demand. With shorter processing times, partners have the opportunity to process larger quantities of raw materials in a single working day. This can increase production flexibility and the MSME's ability to fulfill customer orders.

The mentoring process for the Faiz Mandiri MSME was carried out in stages through mentoring, demonstrations, hands-on practice, and evaluation of the use of flake crushing technology with a speed control system. During this process, partners' mindsets shifted from manual, habit-based work methods to more measurable, technology-based work patterns. Partners also experienced improved skills in operating, regulating speed, and performing simple system maintenance. Direct mentoring increased partners' confidence and awareness that implementing technology not only simplifies work but can also improve efficiency, safety, and productivity. This change represents a form of social transformation, increasing partners' openness, independence, and readiness to adopt technology to support business sustainability and competitiveness. The implementation of flake crushing technology with a speed control system at the Faiz Mandiri MSME has positive social and economic implications. Economically, this technology has the potential to increase production efficiency, reduce labor time, and improve productivity and product quality, thereby supporting increased competitiveness and business development opportunities. Socially, the application of this technology encourages increased skills, technological awareness, and a more effective and safe work culture.

In addition to increasing process speed, the results showed that the use of a shredding machine also improved the uniformity of slice thickness. The machine's mechanical system helps maintain a more stable cutting pattern, thus reducing variations in thickness between slices. In manual processing, the slicing results are highly influenced by operator skill. Differences in hand pressure, material position, cutting angle, work speed, and the operator's physical condition can result in varying slice size and thickness (Lubis et al., 2021). These variations can contribute to inconsistencies in the final product. In contrast, the use of a machine allows the slicing process to proceed through a more controlled mechanism. Under the same operating conditions, raw materials can be processed using a relatively uniform cutting mechanism. This makes the size and shape of the slices easier to control. The application of shredding technology can therefore be seen as part of efforts to standardize the production process. Standardization helps reduce human-caused variation, particularly in the raw material cutting process. With a more controlled process, partners have a stronger foundation for sustainably maintaining product quality. Thus, the benefits of implementing a shredding machine extend beyond increased production speed and capacity. This technology also supports a more structured, efficient, and controlled production process. The integration of increased capacity, reduced processing time, labor efficiency, and improved slice uniformity can ultimately support the competitiveness of Faiz Mandiri's MSMEs.

Conclusion

Based on the results and discussion of community service activities, it can be concluded that the application of chip chopping technology has a positive impact on increasing production process efficiency, labor productivity, uniformity of slice size, and consistency of product quality. The developed chopping machine is able to overcome the limitations of manual chopping methods that depend on the speed and skill of the operator, so that the production process becomes faster, more stable, and more controlled. Quantitatively, the application of the chopping machine is able to reduce the time for chopping raw materials by 20 kg from 69

minutes to 13 minutes, or a time savings of 81.16%. The chopping capacity increased from 17.39 kg/hour to 92.31 kg/hour, or an increase of approximately 431%. In addition, the number of operators required was reduced from two to one, resulting in more efficient use of labor. The results of the activity also showed that the use of the machine helps produce more uniform and consistent slices, thus supporting a more controlled frying process and improving the uniformity of the appearance and quality of chip products. Thus, developing a chip-chopping technology with a controlled system is an effective solution to support the modernization of the Faiz Mandiri MSME's production process. Implementing this technology is expected to increase production capacity, maintain consistent product quality, and strengthen partners' ability to meet market demand. Sustainable benefits must be supported through proper machine operation, regular maintenance, and the implementation of production process standards to ensure continued efficiency and competitiveness of MSMEs. The technology adoption model is carried out through demonstrations, training, hands-on practice, and mentoring so that partners are able to operate and perform simple maintenance independently. To support scalability, the technology can be developed in a simple, affordable, easily replicated form, and adapted to the needs of similar MSMEs. Further development can be supported through collaboration between universities, the government, financial institutions, and the industrial sector, including the use of MSME funding programs. This strategy is expected to expand the application of technology, increase community capacity, and encourage the formation of a more innovative, independent, and competitive MSME ecosystem.

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