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STRATEGY FOR MODERNIZING PRODUCTION PROCESSES AND STANDARDIZING PRODUCTS THROUGH THE IMPLEMENTATION OF THE KAIZEN FRAMEWORK (5S) AT THE "KUSUMARASA" TARO CHIP PRODUCER IN KARANGTEJO VILLAGE, TEMANGGUNG

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Abstract:

Background. This community service activity aimed to analyze the effectiveness of implementing the Kaizen concept through the 5S method in supporting the modernization of production processes and product standardization at the "Kusumarasa" Taro Chips Producer in Karangtejo Village, Kedu District, Temanggung Regency. The main problems faced by the partner included an unsystematic production area layout, the absence of written Standard Operating Procedures (SOPs), inconsistent workplace cleanliness, and varying product quality.

Method. This activity used an educational outreach program consisting of presentations and question-and-answer sessions. The materials delivered covered the Kaizen concept, the 5S method, production process modernization, and product standardization.

Results. The program's effectiveness was evaluated using Pre-Test, Post-Test, and N-Gain Score analyses involving 10 participants, including the business owner and production workers. The results demonstrated a significant improvement in participants' understanding. The average Pre-Test score increased to 64.00 points in the Post-Test, with an average N-Gain score of 1.00 (high category). In addition to improving participants' knowledge, the program produced several outputs, including simple production SOPs, educational posters on 5S implementation in the workplace, and a more organized, clean, and disciplined work culture aligned with Kaizen principles.

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Conclusion. Implementing the Kaizen concept through the 5S method successfully improved workplace organization, production area cleanliness, work discipline, and understanding of the importance of process standardization and product quality. Therefore, implementing the Kaizen Framework (5S) was effective for modernizing production processes and standardizing products in small-scale food processing enterprises, while also supporting increased competitiveness and business sustainability.

Keywords: Kaizen; 5S; production modernization; product standardization; taro chips

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a vital role in supporting national economic growth by creating jobs, increasing community income, and fostering local economic development based on regional potential (Aprilia et al., 2025). In the processed food sector, MSMEs transform local raw materials into value-added products that are competitive in the market (Amanda & Valentino, 2025). One processed food business thriving in rural areas is taro chip production, favored due to the easy availability of raw materials, a relatively simple production process, and significant market potential (Kanefi, 2025). Despite this substantial economic potential, many small-scale processed food businesses still face various production-related challenges. Common issues include the absence of written standard operating procedures (SOPs), unsystematic production facility layouts, quality control based on habit rather than established standards, and inconsistent workplace cleanliness (Rizky & Shadiq, 2023). This lack of standardized production management leads to inefficiencies, increased waste, and inconsistent product quality. These issues not only affect business productivity but also MSMEs' competitiveness amid increasingly intense market competition.

Today's consumers are increasingly attentive to the quality, safety, and consistency of the food products they consume; consequently, MSMEs must produce goods that consistently meet quality standards. If disorganized and poorly documented production practices persist, the risk of product quality non-compliance rises, potentially eroding consumer trust. Furthermore, excessive waste of raw materials, labor time, and resources can diminish operational efficiency and hinder long-term business growth. Therefore,

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implementing the Kaizen concept—specifically through the 5S method and the development of Standard Operating Procedures (SOPs)—serves as a strategic move to enhance production efficiency, ensure food quality and safety, and strengthen MSME sustainability by fostering a work culture characterized by discipline, organization, and a commitment to continuous improvement. In doing so, MSMEs can improve product competitiveness, expand market opportunities, and ensure long-term business viability. Additionally, a disorganized work environment can reduce productivity and increase the risk of production errors (Demirtas et al., 2023). Preliminary observations of the "Kusumarasa" taro chip business revealed that the production facility layout lacks a systematic arrangement; equipment, raw materials, auxiliary materials, and finished products are positioned without a clear organizational plan. This situation renders the production flow inefficient, as workers must constantly move around to retrieve necessary tools and materials.

Improving production quality and efficiency is an important requirement for food-processing MSMEs to survive in increasingly competitive markets. According to Yang and Shao (2023), innovation and standards are strongly interrelated: standardization serves as a platform for disseminating technological innovation while providing market quality assurance. Systematic production process standardization is one strategy to improve business competitiveness. Implementing systematic standardization in the food industry has been shown to increase consumer trust and strengthen product positioning in the market (Giyanti & Indrasari, 2021). Standardization also helps business owners create more structured work processes and facilitates product quality control (Alshahrani, 2026). In addition to standardization, modernizing production processes is an important factor in improving operational efficiency. Modernization in small businesses does not always involve advanced technology; it can also be achieved through improvements to work systems, production area organization, waste reduction, and more effective use of resources (Chen, 2025). A gradual improvement-based modernization approach is considered more suitable for small businesses because it can be implemented simply and does not require substantial technology investment (Machado-Licona et al., 2026). In the context of processed food businesses, workplace cleanliness and organization strongly influence work efficiency and product quality. An unorganized work environment can increase wasted time, slow down production processes, and increase the potential for work errors (Putri Endah Suwarni, 2021). In addition, production area cleanliness is an important aspect of

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maintaining food quality and safety because an unclean production environment may cause product contamination and reduce consumer trust (Juhana, 2025).

In addition to workplace cleanliness and organization, business productivity is also influenced by work discipline, motivation, and the effectiveness of work systems implemented within an organization. A conducive and well-organized work environment has been shown to support employee performance and facilitate business operations. Research indicates that the work environment, work motivation, and work discipline positively affect employee performance. Agustina et al. (2024) reinforce these findings, showing that work discipline, organizational commitment, and person-job fit significantly influence employee performance. These findings emphasize that disciplined work behavior and strong organizational commitment can encourage productivity and more effective achievement of work objectives. Furthermore, leadership and organizational culture that encourage responsibility and employee involvement also influence work effectiveness. Althaf et al. (2025) explained that effective leadership improves work effectiveness by developing a positive work environment and a supportive work culture. These findings indicate that improving work systems, developing a culture of discipline, and involving all organizational members are important factors in increasing productivity and work quality, including in micro and small businesses in the processed food sector.

One approach to improving workplace efficiency and organization is the Kaizen concept. Kaizen is a philosophy of continuous improvement that emphasizes small, consistent changes to improve the quality and efficiency of work processes (Zighan, 2026). Kaizen is well-suited to small businesses because it is simple, flexible, and can be implemented gradually according to business needs (Mui et al., 2021). Kaizen is commonly implemented through the 5S method, which consists of Seiri (Sort), Seiton (Set in Order), Seiso (Shine), Seiketsu (Standardize), and Shitsuke (Sustain/Discipline). The 5S method aims to create a cleaner, more organized, and more efficient work environment, thereby improving productivity and work discipline (Randhawa, 2015). Implementing 5S has also been shown to reduce wasted time, improve workflow, and enhance the overall quality of production processes (Demirtas et al., 2023).

The “Kusumarasa” Taro Chips Producer in Karangtejo Village, Kedu District, Temanggung Regency is a small-scale processed food business that still uses traditional production methods. Based on initial observations, several problems were identified, including the absence of written SOPs, unsystematic arrangement of production tools and

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materials, suboptimal workplace cleanliness, and varying product quality. In addition, a culture of work discipline and awareness of the importance of continuous improvement had not yet been optimally established (Cornellia et al., 2025). These conditions indicate the need for a more structured work system oriented toward continuous quality improvement. Therefore, implementing the Kaizen Framework through the 5S method is considered a relevant strategy for modernizing production processes and standardizing products at the "Kusumarasa" Taro Chips Producer. This approach is expected to improve work efficiency, maintain consistent product quality, and support business sustainability by developing a more disciplined and systematic work culture. Thus, this study aims to analyze the effectiveness of implementing the Kaizen concept through the 5S method in supporting the modernization of production processes and product standardization at the "Kusumarasa" Taro Chips Producer in Karangtejo Village, Kedu District, Temanggung Regency.

METHOD

This study used an educational outreach method involving material presentations and question-and-answer sessions. The activity was conducted at the "Kusumarasa" Taro Chips Producer located in Karangtejo Village, Kedu District, Temanggung Regency. Participants included the business owner and workers directly involved in the production process, totaling 10 participants. The initial stage of the study involved field observation to identify the production process conditions, workplace layout, production environment cleanliness, and work system applied in the taro chips business. The observations showed that the production process was still carried out traditionally and was not yet supported by a structured work system.

The educational outreach activity included materials on the Kaizen concept, the 5S method, production process modernization, and product standardization. After the presentation, the activity continued with a discussion and question-and-answer session, providing participants with an opportunity to explain the challenges they encountered during the production process. The activity was evaluated using a Pre-Test and Post-Test to measure participants' level of understanding before and after the educational outreach. The evaluation results were analyzed using the Normalized Gain (N-Gain) method to determine the level of improvement in participants' understanding of the materials presented. The N-Gain formula used was as follows:

$$g = \text{Post-Test Score} - \text{Pre-Test Score}$$

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100 – Pre-Test Score

Post-Test Score: the participants' final score after the training; Pre-Test Score: the participants' initial score before the training; Ideal Score: the maximum possible score (in this case, 64). The N-Gain interpretation criteria consist of high ($g \geq 0.70$), moderate ($0.30 \leq g < 0.70$), and low ($g < 0.30$) categories. The interpretation criteria for the N-Gain score follow the categories below:

N-Gain Score Range	Effectiveness Category
$g \geq 0.70$	High
$0.30 \leq g < 0.70$	Moderate
$g < 0.30$	Low

Pre-Test, Post-Test, and N-Gain Analysis Results:

Based on data from 10 training participants, the following recapitulates the Pre-Test, Post-Test, and N-Gain Score results. The analysis showed a very significant improvement in understanding. The average Pre-Test score increased to 64.00 points on the Post-Test, with an average N-Gain of 1.00, which was classified as highly effective. These findings indicate that all participants successfully mastered the educational materials optimally.

DISCUSSION

The results of the activity showed that implementing the Kaizen concept through the 5S method produced positive changes in the workplace conditions of the "Kusumarasa" taro chips business. More systematic organization of work equipment and improved cleanliness in the production area created a tidier, more comfortable working environment. In addition, implementing the 5S method helped the business owners understand the importance of production process standardization. With clear work standards, each production stage can be performed more systematically, minimizing production errors and improving the consistency of the resulting product quality. The activity also provided business owners with an understanding of the importance of continuous improvement in production activities. The Kaizen concept encourages business owners to continuously evaluate work processes and seek simple ways to improve efficiency and product quality. Thus, implementing the Kaizen concept through the 5S method can be an effective strategy for supporting production process modernization and product standardization in small and medium-sized enterprises.

Table 1. Stages of the 5S Method

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1	Seiri (Sort)	Separating necessary and unnecessary items in the work area. In small-scale processed food businesses, sorting equipment and raw materials is important to reduce the accumulation of unused items and minimize disruptions in the production process. Proper sorting also helps the producer create a more organized and safe workspace.
2	Seiton (Set in Order)	Placing equipment, raw materials, and finished products according to their functions and the production process flow. Systematic arrangement can reduce the time spent searching for tools and minimize non-value-added movements during production activities. Consistent implementation of Seiton contributes to improved work efficiency and an orderly production flow.
3	Seiso (Shine)	Maintaining the cleanliness of the work area, production equipment, and surrounding environment. In businesses such as chip production, workplace cleanliness plays a direct role in maintaining product quality and safety. The routine implementation of Seiso can increase producers' awareness of cleanliness and reduce the potential for product contamination.
4	Seiketsu (Standardize)	Maintaining the organized working conditions through clear standards and work procedures. Standardization is necessary so that sorting, organizing, and cleaning practices can be carried out consistently by all business personnel. Without documented standards, the implementation of 5S tends to be temporary and difficult to sustain in the long term.
5	Shitsuke (Sustain/Discipline)	An effort to build discipline and a sustainable work culture. This is achieved through routine 5S implementation, periodic evaluation, and active involvement of all parties involved in the production process. The success of 5S depends heavily on the commitment of business personnel to making 5S part of their daily work culture rather than treating it as a temporary activity.

Table 2. Production Stages

No.	Production Stage	Description
1.	Raw Material Preparation Stage	Selecting high-quality raw materials that meet standards is crucial in determining the taste and texture of the chips. Poor-quality raw materials can cause the product to become soft, have an inferior taste, or have an unattractive appearance. During the washing and slicing stages, material cleanliness and uniform slice size are important factors affecting the degree of doneness and crispness. Non-uniform slices can cause some chips to become overcooked or even burnt while others remain undercooked.
2.	Frying Stage	The oil temperature and frying time must be controlled consistently to obtain chips with even doneness, an attractive color, and a crispy texture. Unstable frying temperatures may cause the chips to absorb excessive oil or produce an undesirable taste. After frying, oil draining plays an important role in reducing the oil content of the product, making the chips lighter, less oily, and more appealing to consumers.

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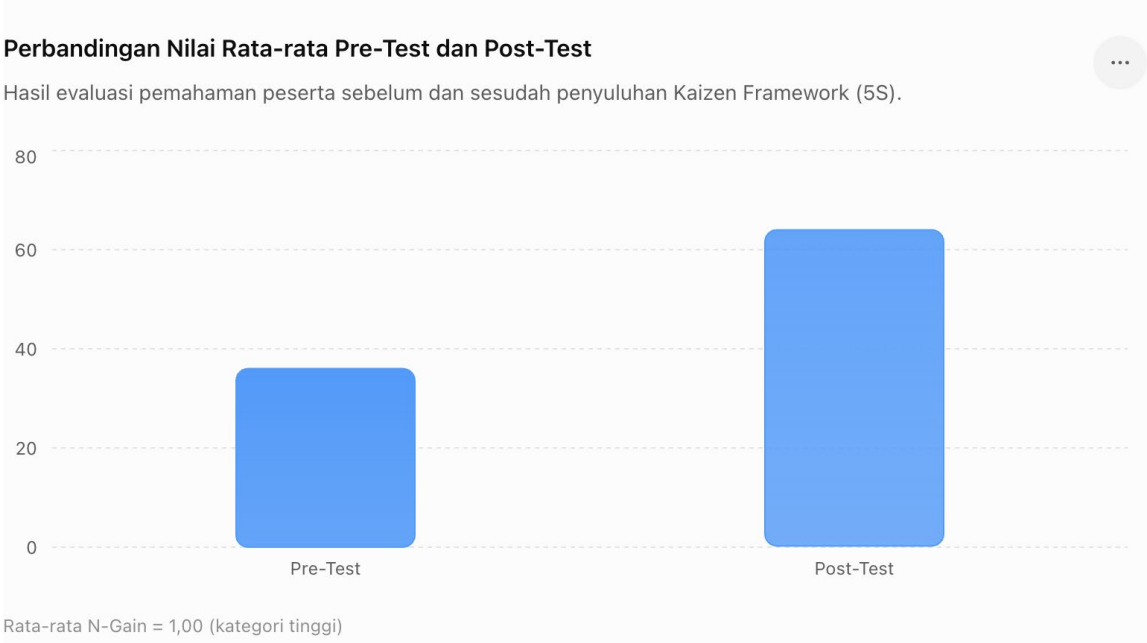
3.	Packaging Stage	Packaging not only protects the product but also helps maintain quality and extend the shelf life of the chips. Proper and hygienic packaging can protect the product from contamination, preserve crispness, and increase its perceived value among consumers. In addition, neat and attractive packaging also influences consumers' perception of product quality.

Graph Presentation



The graph shows a very significant increase in participants' level of understanding after participating in the educational outreach activity. The participants' average score increased from 36 in the Pre-Test to 64 in the Post-Test, an increase of 28 points. This result was reinforced by an N-Gain score of 1.00, which falls into the high category. Therefore, the educational outreach on implementing the Kaizen Framework (5S) was effective in increasing participants' understanding of production process modernization and product standardization.

Picture

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Figure 1. Condition of the production kitchen.

Figure 2. Reviewing the production process

Figure 3. Group Photo with the Business Owner

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Figure 4. Socialization of Production Modernization and Product Standardization

CONCLUSION

The implementation of the Kaizen Framework through the 5S method at the "Kusumarasa" Taro Chips Producer in Karangtejo Village, Temanggung Regency, was proven to have a positive impact in supporting production process modernization and product standardization. Before the activity, the business faced several challenges, including an unsystematic production facility layout, the absence of written Standard Operating Procedures (SOPs), inconsistent workplace cleanliness, and varying product quality due to the lack of clear process standards. These conditions could cause wasted time, reduce work efficiency, and affect the consistency of the resulting product quality. Through the educational outreach activity and implementation of the Kaizen concept using the 5S method, consisting of Seiri, Seiton, Seiso, Seiketsu, and Shitsuke, the partner gained an understanding of the importance of continuous improvement in production activities. Implementing 5S improved the organization of production tools and materials, enhanced workplace cleanliness, created a more effective workflow, and established a culture of discipline in daily production activities. These changes represented an initial step toward creating a more modern, structured, and efficient work system without requiring substantial technology investment. In addition, product standardization through simple SOPs for each production stage provided workers with clearer guidelines. Process standardization, from raw material selection, taro slicing, frying, seasoning, to packaging, helped reduce variations in work processes among workers. Consequently, product quality became more consistent in terms of taste, texture, crispness, and appearance. Standardization also contributed to improving quality control and strengthening product competitiveness in the market.

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Implementation

Overall, implementing the Kaizen Framework (5S) can serve as an effective and applicable strategy for processed-food MSMEs to improve operational efficiency, product quality, and business sustainability. This approach focuses not only on improving the physical conditions of the workplace but also on fostering a more disciplined, organized, and continuous-improvement-oriented work culture. Therefore, implementing Kaizen through the 5S method is recommended to be maintained and further developed as part of efforts to improve the competitiveness of processed-food MSMEs in the future. The implications of this activity indicate that implementing the Kaizen Framework through the 5S method functions not only as a workplace organization tool but also as an MSME capacity-development strategy for building a more modern, standardized, and sustainable production system. From an operational perspective, 5S implementation can reduce wasted time, improve resource-use efficiency, and enhance the organization and cleanliness of the production area. From a food-quality perspective, SOPs and production process standardization contribute to maintaining product quality consistency, reducing potential production errors, and supporting the creation of safer and higher-quality products for consumers. Meanwhile, from a business sustainability perspective, developing a disciplined, organized, and continuous-improvement-oriented work culture is an important asset for MSMEs to increase productivity, strengthen competitiveness, and face increasingly competitive market challenges. The results of this activity also show that production process modernization in MSMEs does not always require high technology investment; it can begin with simple, measurable, and continuous improvements to the work system.

Implication

This publication has implications at multiple levels. Academically, it enriches the literature on Kaizen, 5S, production modernization, and product standardization in small-scale enterprises. Socially, it provides a practical model for improving workplace organization, cleanliness, discipline, efficiency, and product quality among MSMEs. At the national level, implementing Kaizen supports MSME competitiveness, productivity, and business sustainability, contributing to local and national economic development. Internationally, the findings demonstrate that Kaizen and 5S can be adapted as a low-cost and applicable continuous-improvement approach for small-scale food-processing enterprises, particularly in developing and rural economic contexts.

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