

## Improving Product Quality through the Implementation of Good Manufacturing Practices and Vacuum Packaging in Smoked Catfish Businesses in Pasaman

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Received:  
6 December 2024

Revised:  
15 March 2025

Accepted:  
20 May 2025

Published:  
31 May 2025

### Abstract

*The production of smoked catfish in Pasaman Barat faces several challenges, including traditional smoking processes that lack the implementation of Good Manufacturing Practices (GMP), inadequate packaging and labeling, and limited marketing strategies. These conditions result in inconsistent product quality, a short shelf life, and low market competitiveness. This community service program aims to improve the product quality and sustainability of the Gusni Afrida MSME partner through the application of GMP, enhanced packaging techniques, and the development of digital marketing strategies. The methods employed include training in GMP implementation, vacuum packaging techniques, labeling, replacement of equipment compliant with GMP standards, and mentoring in GMP applications. The program enhances the partner's understanding of GMP, vacuum packaging techniques, labeling, production management, and digital marketing, accompanied by the practical implementation of GMP. This involves the use of equipment that meets GMP standards, employing proper production personnel attributes, vacuum packaging techniques, and attractive product labeling. In addition, e-commerce-based marketing broadens market access. Implementation of this program is expected to positively impact the quality, efficiency, and competitiveness of the partner's products. The adoption of GMP and modern marketing strategies can serve as models for the development of small businesses in the local food industry.*

**Keywords:** digital marketing, good manufacturing practices, smoked catfish, vacuum packaging

## **INTRODUCTION**

Catfish is one of the most prominent freshwater aquaculture commodities widely cultivated by the community (Lutfiyanah & Djunaidah, 2020). Catfish production in West Sumatra ranged between 41,549 and 50,407 tons annually from 2017 to 2020 (BPS, 2024). Catfish are perishable foods that require proper processing to maintain quality and prevent spoilage. In the tourist destination of Pasaman Barat, smoked catfish, or ikan salai, is a signature culinary product often brought home as a local delicacy. Smoking is a fish processing method that imparts a distinctive flavor and aroma derived from combustion byproducts. Additionally, it serves as a preservation technique. However, many Micro and Small Enterprises (MSEs) still use traditional smoking methods with traditional tools and do not apply proper Good Manufacturing Practices (GMP), from handling raw materials to packaging the final product. This often causes uneven smoking temperatures, which leads to inconsistent product quality, such as under or overcooked fish, unattractive appearance due to simple packaging, and short shelf life.

These issues are also faced by the Gusni Afrida Smoked Catfish Micro and Small Enterprise (MSE) in Pasaman Barat, which has been in operation since 2010. The business is still run by the owner, who also handles direct sales and distribution. Its marketing is currently limited to traditional markets and direct consumer orders. This community service initiative was designed to help the enterprise by introducing GMP principles, improving packaging, and strengthening marketing efforts. Furthermore, marketing improvements include using vacuum-sealed plastic packaging and clear labeling to provide product information, meet regulatory standards, and support the process of obtaining business and distribution permits.

## **METHODS**

The partner location for the community service activity was in Batang Lingkin, Nagari Lingkuang Aua, Pasaman District, Pasaman Barat Regency. The implementation method comprised several stages designed to address the challenges faced by the partner. This community service program was conducted over a period of eight months and included three main phases: preparation, execution, and evaluation, as detailed below:

1. Information gathering on the partner's conditions

This stage, conducted during the first month, involved site surveys and discussions with partner to identify existing problems and specific needs. Priority challenges include the implementation of GMP, improvement of packaging techniques to enhance product quality, and compliance with business licensing requirements, including registration for the Home Industry Food Production License (PIRT). This stage served to establish mutual understanding and align the objectives between the community service team and enterprise.

2. Activity planning and technology transfer to the partner

This stage, which was carried out in the first month, included planning activities based on the identified issues to address the partner's challenges. Preparations for technology transfer involve determining the specifications of the required equipment and designing product logos and packaging. This stage ensured that the completion of a detailed activity plan was mutually agreed upon with the partner.

3. Socialization

This stage, conducted in the second month, involved the socialization of activities developed by the community service team with the partner to ensure alignment and mutual understanding. It also aimed to increase the partner's awareness of the program's objectives, benefits, and implementation timeline.

4. Training on GMP, vacuum packaging technology, labeling, production and marketing management and fulfillment of business licensing and PIRT requirements

This stage consisted of two training sessions conducted in the third and fourth months. The training provided fundamental knowledge on proper food processing in accordance with GMP standards, as well as production management aimed at improving operational efficiency. In addition, the sessions included practical demonstrations on the application of vacuum packaging techniques using a vacuum sealer with newly designed packaging, implementation of product coding procedures, and assistance in preparing the necessary documentation for business licensing and PIRT registration. Training was delivered through a combination of lectures, discussions, and consultations. The outcomes of this stage include improved knowledge and understanding of GMP principles, vacuum packaging technology, basic production planning, cost estimation, and marketing strategies. Furthermore, the partner gained awareness of the regulatory requirements that must be fulfilled and, at a minimum, obtained a registered business identification number.

5. Implementation of GMP and vacuum packaging techniques in production

This stage was conducted during the fourth and fifth months after the completion of the training sessions. At this stage, GMP practices were implemented, beginning with the enforcement of personal hygiene standards for employees, including the use of appropriate personal and production equipment under the guidance of the community service team. Improvements and replacements of production tools, such as fish-cleaning equipment, smoking apparatus, and final product packaging, have also been introduced. The outcomes of this stage include the application of GMP principles and vacuum packaging technology within the production cycle, improved product appearance, and extended product shelf life.

6. Training on developing and utilizing online media/technology (e-commerce)

Digital marketing training was conducted during the fifth month. During this stage, the partner received training and mentoring on creating, utilizing, and managing e-commerce platforms to expand product marketing, which had previously been limited to offline sales in traditional markets across West Sumatra. The outcome of this stage was the partner's introduction of basic digital marketing tools and the establishment of at least one online sales channel.

7. Mentoring and monitoring

This stage was conducted from the fifth to the seventh month and involved mentoring and monitoring the implementation of GMP in production processes, the application of vacuum packaging techniques, and the partner's management of e-commerce platforms. The outcome of this stage was that the partner received continuous guidance to ensure the consistent application of the newly introduced practices.

8. Program evaluation

Evaluations were conducted from the sixth to eighth month and constituted the final stage of this community service program to assess the partner's progress and improvements. The community service team conducted periodic field evaluations to measure the program's effectiveness and identify areas for further development.

## RESULTS AND DISCUSSION

The community service program was conducted from May to December 2024, encompassing all stages, from the initial survey to program evaluation. The smoked catfish production process carried out by the partner included the following steps: removal of entrails and gills, washing, arranging the fish on the smoking rack (commonly referred to as the salai rack), smoking, sorting, and packaging. The smoking process involved stacking 8–10 salai rack units in a smoking furnace fueled by a combination of wood and coconut husks. This process requires approximately two days and one night to achieve the desired level of dryness specified by the partner.

### **Training on production, management, and marketing aspects**

To address production issues, the partner was provided with training on the principles of Good Manufacturing Practices (GMP), vacuum packaging techniques, and labeling. Implementing GMP is a crucial priority for partners because of its significant role in food processing businesses. GMP is one of the most essential and effective methods for rectifying errors in the food supply chain (Madilo et al., 2022). GMP training also covered aspects of production personnel attributes, which had not yet been implemented by the partner, as workers did not possess proper production uniforms or equipment. Implementing GMP using complete production attributes has been shown to reduce microbial contamination in products (Fitriana et al., 2020). Furthermore, Hasnan et al. (2022) reported that insufficient training and understanding of GMP, along with poor personal hygiene among production staff, accounted for approximately 35% and 55% of non-compliance with GMP requirements in the food industry of Micro, Small, and Medium Enterprises (MSMEs), respectively. This highlights the critical importance of training and personal hygiene for the successful implementation of GMP in the MSME food industry.



**Figure 1.** Training on production, management, and marketing aspects for the partner

The next training session covered vacuum packaging and labeling. Currently, the partner's final smoked catfish product is packaged using cardboard as the primary packaging with a shelf life of two weeks. Vacuum packaging can extend a product's shelf life by creating an oxygen-free environment within the packaging, thus inhibiting microbial growth and reducing the likelihood of oxidation caused by oxygen, which can shorten the shelf life of the product. Vacuum packaging can extend the shelf life of food products by nearly three-fold compared to non-vacuum packaging using the same type of packaging (Efendi et al., 2021). Regarding product labeling, in addition to meeting the requirements set by BPOM Regulation No. 31 of 2018 on processed food labeling, labeling can enhance consumer appeal by providing clear information. Labeling, design, and packaging have a positive impact on product quality (Suparman et al., 2023). Attractive packaging is a key factor influencing consumers' purchasing decisions (Hasanah & Pambudi, 2023).



**Figure 2.** Training on vacuum packaging and labeling for the partner

In terms of management issues, partners have generally not recognized the importance of production and marketing management due to limited information. Therefore, training in these two aspects is essential. Understanding production and marketing management is fundamental for effective operations and maintaining competitiveness (Rudiawan et al., 2021). In the case of the partner, record-keeping covering material arrivals, production processes, the use of smoking fuel, and sales has not been consistently performed, which may lead to unclear production flows and difficulties in monitoring operational efficiency. Without proper record keeping, the partner struggles to evaluate resource usage and identify areas for improvement, such as material or energy waste. This also hampers inventory management and the ability to more accurately plan production. To address this, an initial intervention would be the implementation of a more structured recording system, even if manual. Thus, the goal of operational management to facilitate improvements and enhance service quality in the form of products can be achieved (Purnomo & Astutiningsih, 2021). In terms of marketing, digital marketing is the most significant method because of its ease of access to customers, high effectiveness, and low cost (Arumsari et al., 2022). Therefore, e-commerce is considered to be an effective marketing method. Additionally, creating attractive packaging is expected to improve the product's image and positively impact consumer purchase decisions (Suprpto et al., 2020).

#### **The implementation of Good Manufacturing Practices (GMP), packaging, and labeling on the partner's products**

From the equipment perspective, the implementation of Good Manufacturing Practices (GMP) requires that equipment in contact with food materials be durable, easy to maintain, and easy to clean. Wooden equipment is still widely used by the partner, especially in cases where the equipment has already experienced damage, such as the fish splitting table, smoking rack table, and smoking racks used in the smoking process. Providing GMP training aims to offer an understanding of both the partner and production personnel. For its implementation, the service team provides replacement equipment that meets GMP requirements, such as stainless-steel tables for fish splitting (gutting and gill removal), smoking rack tables, stainless steel knives, and primary equipment, namely an oven and stainless-steel smoking racks. The use of wooden materials by SMEs in the food industry is highly susceptible to contamination (Najah et al., 2020). In the food processing industry, the use of wood requires strict cleaning and maintenance because of its water absorption and porosity, which can lead to organic material being trapped and left behind in the production process, fostering microbial growth.

Regarding the smoking process, which is the main process for the partner, traditional smoking using wooden racks stacked in an open condition presents several issues such as uneven cooking, inefficient fuel use, and hygiene concerns. Replacing the equipment with an oven and



stainless-steel smoking racks addresses these issues. Although traditional smoking imparts distinctive flavors to the final product, it poses challenges in production practice, lacks control over the process and food safety standards, and involves long smoking times (Guidzavaï et al., 2023). The provided oven is a modification that still uses the partner's smoking stove, with a uniform smoke discharge and a closed condition, ensuring product hygiene and using stainless steel materials that comply with GMP standards while retaining the final flavor imparted by wood and coconut husk as fuel. Using oven-based smoking techniques can reduce smoking time and improve product quality (Faridah et al., 2022).



(a)



(b)

**Figure 3.** (a) Provision of production equipment to meet GMP requirements; (b) Packaging and labeling of products

Additional assistance includes providing industrial baskets for raw catfish, both before and after gutting, and covering industrial baskets for the finished product as replacements for used cardboard that was previously employed by the partner. Furthermore, the service team provided production personnel with complete uniforms, including aprons and production shoes. All the equipment and production tools provided aim to meet GMP requirements, maintain hygiene, and enhance product quality. Regarding packaging and labeling, the service team provided vacuum-sealing machines, vacuum packaging, and labels designed in compliance with processed food labeling requirements. This aims to fulfill the requirements for business and distribution permits (SPP-IRT) and enhance product appeal, enabling the partner to begin marketing via e-commerce (online). The monitoring and evaluation results of GMP implementation in the production process and vacuum packaging successfully extended the shelf life of the product to four months. Additionally, through the adoption of attractive packaging, labeling, and digital marketing, the partner established an online store to sell smoked catfish products. These achievements demonstrate an improvement in product quality and the partner's capacity for online marketing, thereby enabling broader market reach.

## CONCLUSION

The implementation of Good Manufacturing Practices (GMP) at the Gusni Afrida Smoked Catfish Micro, Small, and Medium Enterprise (MSME) in Pasaman Barat has had a positive impact on improving product quality and production process efficiency. Interventions such as GMP training, replacing wooden equipment with stainless steel, using an oven for smoking, and vacuum packaging could enhance various aspects of production, including hygiene, shelf life, and product consistency. The use of an oven for smoking not only improves time efficiency, but also preserves the distinctive flavor of smoked catfish. Additionally, the implementation of a simple record-keeping system could improve production management from raw material handling to marketing. The product's appeal has been further increased through vacuum packaging and labeling that

comply with BPOM standards, providing significant added value and broadening the market reach, including via e-commerce. Overall, the integrated application of GMP, combined with improvements in equipment, packaging techniques, and marketing strategies, has provided an effective solution to enhance the competitiveness of smoked catfish products while also supporting MSME development in meeting food safety standards and expanding market reach. As a potential next step, further efforts are recommended to assist the enterprise in obtaining PIRT, Halal and HACCP certifications. These certifications would strengthen consumer trust, ensure compliance with broader food safety and religious standards, and open access to larger retail markets, both domestically and internationally.

## ACKNOWLEDGEMENTS

This community service program is funded by Universitas Andalas through the scheme of "Program Kemitraan Masyarakat Membantu Usaha Berkembang (PKM-MUB)" Batch I (contract number: 60/UN16.19/PM.03.03/PKM-MUB/2024) for the 2024 fiscal year.

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