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Community service to increase red chilli economic value with post-harvest technology at Poktan Berkah Tani, Pulau Gambar Village, Serbajadi District, Serdang Bedagai District

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ABSTRACT
In Indonesia, especially North Sumatra, chilli is a horticultural good that the people consume extensively. The availability and demand for red chillies in society are quite erratic; when production rises, the price of red chillies is rather low; when production falls, the price of red chillies will rise because of commodity shortage. Processing fresh chillies into chilli sauce, therefore, is one way to solve this issue. Making chillies into chilli sauce improves shelf life and sales value and makes sense for consumption, tastes great and refreshing, and accentuates the flavour of meals. Training courses on food safety for the Pulau Gambar people in Serbajadi District, Serdang Bedagai Regency, concentrated on chilli sauce processing technology and comprised the community service activities. The training sought to equip the residents with the tools required to create premium chilli sauce, which can be both a source of income and a way to support local cooking customs. Improving their understanding of food safety and processing methods will help the community to guarantee that their goods satisfy health criteria and also attract a larger market. This exercise seeks to guarantee the produced chilli sauce is fit for consumption. The approach was applied sauce. Of the 37 participants in the service activities, 100% said the outcomes were favourable; 69% (15 people) said they intended to try it themselves, and 31% said they were not sure yet.
Keyword: Chilli Sauce, Community Service, Post-Harvest Technology, Serbajadi, Serdang Bedagai

ABSTRAK
Di Indonesia, terutama di Sumatra Utara, cabai merupakan komoditas hortikultura yang dikonsumsi secara luas oleh masyarakat. Ketersediaan dan permintaan cabai merah di masyarakat cukup fluktuatif; ketika produksi meningkat, harga cabai merah cenderung rendah; ketika produksi menurun, harga cabai merah akan naik karena kelangkaan komoditas. Pengolahan cabai segar menjadi saus cabai merupakan salah satu cara untuk mengatasi masalah ini. Mengolah cabai menjadi saus cabai meningkatkan umur simpan dan nilai jual, serta lebih praktis untuk dikonsumsi, rasanya enak dan menyegarkan, serta memperkuat cita rasa masakan. Pelatihan keamanan pangan bagi masyarakat Pulau Gambar di Kecamatan Serbajadi, Kabupaten Serdang Bedagai, berfokus pada teknologi pengolahan saus cabai dan merupakan bagian dari kegiatan pelayanan masyarakat. Pelatihan ini bertujuan untuk membekali warga dengan alat yang diperlukan untuk membuat saus cabai premium, yang dapat menjadi sumber penghasilan dan cara untuk mendukung tradisi masakan lokal. Meningkatkan pemahaman mereka tentang keamanan pangan dan metode pengolahan akan membantu komunitas memastikan produk mereka memenuhi kriteria kesehatan dan menarik pasar yang lebih luas. Upaya ini bertujuan untuk memastikan saus cabai yang diproduksi aman untuk dikonsumsi. Pendekatan ini diterapkan pada saus. Dari 37 peserta

dalam kegiatan pelayanan, 100% menyatakan hasilnya positif; 69% (15 orang) menyatakan berniat mencobanya sendiri, dan 31% menyatakan belum yakin.
Keyword: Pengabdian Kepada Masyarakat, Saus Cabai, Serbajadi, Serdang Bedagai, Teknologi Pasca Panen,

1. Introduction

Chili is a widely consumed horticultural commodity in Indonesia, particularly in North Sumatra, where it plays a significant role in both local cuisine and farmers' livelihoods. However, the fluctuation in supply and demand leads to unstable market prices—prices tend to plummet during harvest peaks and surge during shortages [1, 2, 7]. This instability negatively affects farmers, especially those with limited access to post-harvest processing technologies.

Poktan Berkah Tani, a farmer group managing 18 hectares in Hamlet 13, Pulau Gambar Village, Serbajadi District, Serdang Bedagai Regency, North Sumatra Province, cultivates a variety of horticultural crops including red chillies, cayenne peppers, tomatoes, eggplants, long beans, cucumbers, spinach, kale, and mustard greens. Red chillies are particularly abundant during the harvest season, with yields reaching up to 5 tons/ha/planting season. Despite the high production, farmers often face losses due to spoilage and low market prices during peak harvest [1, 2].

The group is well-organized in terms of land management and crop diversity but still faces several constraints. Most partner farmers have limited knowledge of post-harvest handling and minimal access to processing technologies. The current practice focuses on selling fresh produce directly to the market, which becomes problematic when prices fall below Rp. 10,000/kg, significantly lower than the cultivation and harvest costs. Furthermore, red chillies, being high in moisture content, are highly perishable and susceptible to quality degradation without proper storage or processing [3–6].

To address these challenges, it is crucial to introduce appropriate post-harvest technologies that enhance product shelf life and economic value. One practical solution is to process red chillies into chilli sauce, a product with increasing demand due to its popularity in local dishes like meatball noodles, chicken noodles, and fried chicken. Chilli sauce production, based on good quality chillies (Capsicum SP) and spices, follows the Indonesian National Standard (SNI 01-2976-2006) [8]. The addition of ingredients like salt, sugar, garlic, and starch enhances the product's appeal, while simple machinery such as grinders, cookers, and packaging tools can enable home-scale production [9].

A community service initiative was conducted to support Poktan Berkah Tani by introducing chilli sauce processing and food safety practices. The program aimed to equip farmers with practical skills in value-added processing, contributing to food security and economic resilience. It combined counseling sessions and hands-on training in chili sauce production, emphasizing compliance with food safety standards.

2. Methods

This community service activity was conducted in Pulau Gambar Village, Serbajadi District, Serdang Bedagai Regency, North Sumatra Province. The program focused on empowering local farmers to address the post-harvest challenge of red chilli oversupply through value-added processing—specifically by producing chilli sauce that is safe for consumption and has a longer shelf life.

2.1. Time and location of activities

The Regular Year Mono Community Service Team of Universitas Sumatera Utara Community Service Institute (LPPM) performed this community service for POKTAN BERKAH TANI in Hamlet 13, Pulau Gambar Village, Serbajadi District, Serdang Bedagai Regency, North Sumatra from June to November 2023.

2.2. Equipment description

The chilli sauce production training utilized the following equipment:

- Chilli Grinder Machine (Capacity: 20 kg/hour): a stainless steel-based grinding machine used to crush

fresh red chillies into a smooth paste. The grinder ensures uniform particle size and enhances the consistency of the sauce.
- Stainless Steel Sauce Cooker and Stirrer (Capacity: 30 liters): this cooking equipment is used to heat and homogenize the chilli paste with spices and other ingredients. It includes a mechanical stirrer to ensure even cooking and prevent burning.
- Manual Bottle Filler (Capacity: 500 bottles/day): used for hygienic filling of cooked chilli sauce into sterilized bottles. This tool helps to improve packaging efficiency.
- Bottle Sealer and Label Applicator: ensures tight sealing to extend shelf life and applies standardized labels for improved market presentation and traceability.

2.3. Socialization and training activities

The program included socialisation and hands-on training sessions to increase farmers' knowledge and skills in chilli sauce processing and food safety. A total of 37 local residents participated in the training sessions, consisting of members of the Berkah Tani farmer group and other interested villagers. Introduction to Post-Harvest Problems: A discussion on the volatility of red chilli prices and spoilage issues during peak harvest seasons. Chilli Sauce Production Techniques used step-by-step practical training in sauce preparation, including selection of raw materials, grinding, cooking, seasoning, and bottling.

Food safety and hygiene practices: was provided education on hygiene standards for chilli sauce, adhering to SNI 01-2976-2006, which included standards for ingredients, sterilisation, and packaging techniques. Entrepreneurial development: The training also included an introduction to small-scale agribusiness models, production cost analysis, pricing strategy, and potential market channels. The main objectives of the training were to improve farmers' knowledge of chilli processing and food safety, to enhance the value and shelf life of their chilli produce, to equip participants with skills to start home-based chilli sauce businesses, and to reduce post-harvest losses and increase farmer income. The program included socialisation and hands-on training sessions to increase farmers' knowledge and skills in chilli sauce processing and food safety. A total of 37 local residents participated in the training sessions, consisting of members of the Berkah Tani farmer group and other interested villagers.

Introduction to Post-Harvest Problems: A discussion on the volatility of red chilli prices and spoilage issues during peak harvest seasons. Chilli Sauce Production Techniques used step-by-step practical training in sauce preparation, including selection of raw materials, grinding, cooking, seasoning, and bottling. Food safety and hygiene practices: We provided education on hygiene standards for chilli sauce, adhering to SNI 01-2976-2006, which included standards for ingredients, sterilisation, and packaging techniques.

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2.4. Monitoring and evaluation

To determine the effectiveness and impact of the community service program, a structured monitoring and evaluation process was implemented using both qualitative and quantitative methods.

Evaluation Tools:

- Pre- and Post-Training Questionnaires: Administered to assess participants' knowledge, attitudes, and readiness to implement chilli sauce processing techniques.
- Observation Sheets: Used during the hands-on sessions to evaluate participant engagement, skill acquisition, and adherence to food safety protocols.
- Follow-up Interviews: Conducted with selected participants after the training to gather feedback and monitor early-stage implementation.

Indicators of Success:

- Knowledge Gain: Measured by comparing pre- and post-test scores using a standardized scoring rubric (scale of 0–100).
- Behavioral Intention: the percentage of participants expressed their intention to try the process independently.
- Engagement Level: Measured through attendance, participation in practical sessions, and completion of tasks during the training.
- Adoption Rate: Planned to be assessed within three months through field visits to observe whether participants have begun production activities.

Data Analysis:

- All collected data were analyzed descriptively using frequency, percentage, and score comparison to identify trends, gaps, and overall program effectiveness.
- The structured and measurable evaluation approach ensures that the program's impact can be assessed, improved upon in future activities, and used as a model for similar interventions in other horticultural communities.

3. Results and Discussion

This activity involves implementing several activities, such as providing guidance on raw materials, manufacturing techniques, company overview, production training, economic analysis, business management, administration, and marketing. This activity entails providing instruction on manufacturing chili sauce from materials per SNI standards, resulting in chilli sauce products that comply with the Ministry of Health's requirements for such goods—high-quality chili sauce accompanied by chili sauce production equipment. The service conducted via early observation and orientation techniques revealed that the primary challenge encountered was a need for more understanding.

3.1. Overview of activities and community involvement

The community service initiative was successfully implemented in Pulau Gambar Village, Serbajadi District, Serdang Bedagai Regency, with the active involvement of the Berkah Tani farmer group. The programme began with socialisation sessions, focus group discussions (FGDs), and needs assessments aimed at identifying local agricultural challenges, particularly the issue of fluctuating red chilli prices caused by unstable production volumes. Figure 1 illustrates the FGD sessions, where participants enthusiastically exchanged ideas and feedback. These discussions highlighted a common concern: the frequent oversupply of fresh chillies leading to economic losses due to perishability. The community expressed strong interest in post-harvest innovations that could help add value and extend the shelf life of chilli products.

Figure 1. Community service team during FGD session.

3.2. Delivery and utilisation of processing equipment

In response to the identified needs, the USU Community Service Team delivered a full set of chilli processing equipment, which included a chilli grinder, sauce cooker and stirrer, and a manual filler (Figure 2). Local

officials and community members attended a formal handover session to introduce these machines, demonstrating strong institutional support. Training sessions were subsequently held, focused on the proper use of the equipment, hygiene practices, and chilli sauce production according to SNI 01-2976-2006 standards (Figure 3). These hands-on sessions enabled participants to grasp each stage of the process—from raw material handling and grinding to cooking, filling, and packaging.

Figure 2. USU community service team gives Poktan Berkah the machine.

Figure 3. Processing chili sauce.

3.3. Empowerment through knowledge and skill development

The training significantly enhanced participants' understanding of chilli sauce processing and food safety. Prior to the program, most community members lacked awareness of basic food hygiene practices and standard processing methods. Detailed modules on the following topics addressed this gap: Selection of fresh, high-quality raw chillies. Grinding and cooking processes using stainless-steel equipment. Ingredient measurements and temperature control. Bottling techniques that meet safety and storage requirements.

Based on pre- and post-training evaluations, the knowledge and skill levels of participants improved substantially. All 37 participants rated the training positively, and 69% (15 individuals) expressed a clear intention to start their own small-scale production, while the remaining 31% indicated interest but hesitated due to financial or time constraints. 69% of participants in this program showed readiness to implement what they had learnt, indicating stronger acceptance and application.

Furthermore, this result confirms the role of context-sensitive training. The combination of equipment donation, technical training, and participatory dialogue led to greater motivation among the Pulau Gambar community members. This finding reinforces the theory that community ownership and hands-on participation

are critical to sustaining rural innovations.

These findings are in line with prior studies emphasising that post-harvest technology is a key driver for rural innovation. It enhances product quality, extends shelf life, and reduces food waste while opening opportunities for product diversification and market expansion (e.g., chilli sauce, dried chillies, or chilli powder).

3.4. Discussion based on theory and previous research

The implementation of post-harvest technology in rural areas like Pulau Gambar demonstrates several benefits consistent with published research:

- Economic Value Enhancement: Converting fresh chillies into value-added products like chilli sauce increases their commercial appeal and reduces their dependence on fluctuating market prices. This transformation allows farmers to reach new consumer segments and earn better profits.
- Preservation and Food Safety: Chilli sauce processing extends shelf life, reduces spoilage, and ensures hygiene. Participants in this program now understand the importance of maintaining food safety standards, which are essential for attracting broader markets and meeting regulatory requirements. This initiative is supported by the Ministry of Health's standards on processed foods.
- Capacity Building: The success of this project is a testament to how training and mentoring can improve local capacities. As per the theoretical background in the manuscript, the enhancement of individual knowledge and technical skills is a foundational element for sustaining agricultural value chains.
- Stakeholder Support and Accessibility: The involvement of the local government and ease of access to the location via Medan supported the smooth execution of the activities. Collaboration between the university, community, and government created a synergistic environment essential for sustainable development.
- Sustainability Concerns: While red chillies are less affected by seasonality than other crops, ongoing challenges remain in harvest management and the consistent availability of fresh chillies for processing. This highlights the importance of developing integrated systems for production, post-harvest processing, and marketing.

4. Conclusions

The implementation of community service activities in Pulau Gambar Village successfully addressed key challenges faced by red chilli farmers, particularly in managing post-harvest losses and adding economic value to their produce. Through a structured programme comprising socialisation, needs assessment, equipment support, technical training, and mentoring, the initiative empowered the Berkah Tani farmer group with essential knowledge and skills in chilli sauce production aligned with SNI standards and food safety guidelines.

The delivery and utilisation of chilli processing equipment—combined with practical, context-sensitive training—significantly improved participants' understanding of hygienic production processes, temperature control, ingredient standardisation, and safe packaging. Pre- and post-training evaluations demonstrated a marked increase in knowledge and confidence, with 69% of participants expressing readiness to initiate small-scale production. These outcomes validate that hands-on training, participatory dialogue, and stakeholder collaboration are crucial for sustainable rural innovation.

The initiative highlighted the importance of institutional support, accessibility, and continuous mentoring in ensuring long-term impact and adoption. To ensure sustainability, future programs should also focus on strengthening harvest management systems and ensuring a consistent supply of quality raw materials.

This service initiative demonstrates that integrating education, technology transfer, and community engagement is an effective model for promoting rural agro-industry development and improving local livelihoods.

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