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Improving the productivity and shelf life of Swasti jackfruit dodol through appropriate technology

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ABSTRACT

Swasti jackfruit dodol has been produced since 1996 by Swasti Home Industry in Jasri Village, Karangasem Regency, Bali. However, the enterprise faced several challenges, including labor-intensive processing, weather-dependent drying, limited production capacity, inconsistent product quality, and short shelf life, which reduced its ability to meet increasing market demand. This community service program aimed to improve production efficiency, strengthen partners' technical capacity in operating appropriate technology, improve product quality and shelf life, and support the competitiveness of the home industry. The program adopted a participatory action research approach consisting of problem identification, training and mentoring, and monitoring and evaluation. The appropriate technologies introduced included an automatic dodol cooker and stirrer, a food dehydrator, and aluminum foil standing pouch packaging with a hand sealer. The program improved the partners' knowledge and practical skills in processing and packaging jackfruit dodol. Cooking time was reduced from 4–5 hours to 1.5 hours, drying time decreased from 7–10 days to 2 days, and product shelf life increased from two to four months. These improvements supported increased production efficiency and capacity, enabled the partners to better respond to market demand, and supported the sustainable adoption of appropriate technology for long-term business development.

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1. INTRODUCTION

Home industries (SMEs) in the culinary sector that utilize locally available resources have the potential to develop into regional specialty food producers and contribute significantly to the Indonesian economy (Prasetiyo et al., 2025). One example is Swasti Home Industry (IRT Swasti), a well-known local souvenir producer. Located in Jasri Village, Karangasem District, Karangasem Regency, Bali Province, IRT Swasti is owned and managed by Mrs. Ni Made Suasti (71 years old). By utilizing the abundant jackfruit resources available in Karangasem Regency (Suryawan et al., 2016), she has successfully transformed jackfruit into dodol, a traditional confectionery product that represents both local identity and economic potential.

Jackfruit (Artocarpus heterophyllus) is easily spoiled; therefore, processing it into jackfruit dodol is an effective strategy for extending its shelf life, increasing its economic value, and diversifying local

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food products (Nurhayati et al., 2020; Silalahi, 2021). Nevertheless, maintaining product quality and production continuity remains a challenge for small-scale home industries that continue to rely on conventional processing methods.

Field observations and interviews conducted by the community service team revealed several interconnected production constraints at Swasti Home Industry. The existing traditional production process and its major constraints are presented in Figure 1. The cooking process requires approximately 4–5 hours and involves continuous manual stirring to prevent the product from overcooking. This prolonged heating process, while requires intensive labor, is also contributes to the formation of a distinctive aroma through sugar caramelization (Setiavani et al., 2018).

After cooking, the product must be dried to prevent mold growth. Conventional drying is performed under direct sunlight for 7–10 days and may take up to 14 days during cloudy weather or the rainy season. This condition makes production highly dependent on weather and increases the risk of contamination from dust and other environmental pollutants (Alit et al., 2019; Sutanto et al., 2019).



Figure 1. Production process of Swasti jackfruit dodol:
(a) Cooking and stirring; (b) Drying; (c) The end product of jackfruit dodol

Based on interviews conducted by the community service team with the owner of Swasti Home Industry (Figure 2), these production constraints were closely related and significantly affected the business's performance. The lengthy cooking process reduced production efficiency, while weather-dependent drying delayed product availability, subsequently limiting stock inventory. Combined with inadequate packaging and a relatively short shelf life, these conditions made it challenging for the enterprise to maintain consistent product quality and meet increasing customer demand, particularly during periods of high tourist arrivals and Hindu religious ceremonies in Karangasem. Consequently, Swasti Home Industry faced limited production capacity, missed market opportunities, and restricted business growth.



Figure 2. Community service team conducting an interview with the owner of Swasti home industry

These challenges can be addressed through the implementation of appropriate technology to improve the efficiency of jackfruit dodol production. The community service team provided an automatic cooking and stirring device. This technology improves cooking efficiency, reduces manual labor, and can increase daily production capacity while supporting the overall quality of the final product (Alit et al., 2019; Zainuddin et al., 2020).

Additionally, a food dehydrator was also introduced to support the drying process. The food dehydrator can be operated at times when there is little to no sunlight, such as nighttime and during the rainy season, allowing production to continue without depending on weather conditions (Sutanto et al., 2019). The device is equipped with an automatic temperature control system that can reduce manual labor requirements and operational costs (Wiratama et al., 2019).

To further extend the shelf life of jackfruit dodol, the community service team introduced aluminum foil standing pouches sealed using a hand sealer. This type of packaging not only provides an attractive appearance but also protects the product from exposure to light and air (Kusumawati et al., 2025; Manurung et al., 2023).

The implementation of appropriate technology in community service programs is not limited to improving production efficiency but also plays a strategic role in strengthening the technical capacity, independence, and competitiveness of micro, small, and medium enterprises (MSMEs). Previous studies have demonstrated that technology-based empowerment programs combined with participatory mentoring can enable MSMEs to adopt innovations more effectively, improve operational performance, and sustain business development over the long term (Fuadi et al., 2021; Harinurdin et al., 2025).

Furthermore, continuous capacity-building activities through training, hands-on practice, and regular monitoring have been shown to improve partners' technical competencies, encourage technology adoption, and support business sustainability (Orbawati et al., 2025; Surbakti, 2025). Therefore, community empowerment programs should integrate technology transfer with continuous mentoring to ensure that introduced innovations are effectively adopted and provide sustainable economic benefits for partner enterprises.

This community service activity was conducted to address the challenges faced by Swasti Home Industry in the processing and drying of jackfruit dodol and to improve product durability through the use of standing pouch packaging. Through the community service program, the implementation of appropriate technology and continuous mentoring was expected to improve production efficiency, maintain product quality, extend shelf life, and increase the enterprise's capacity to meet market demand. Essentially, the program was expected to support the sustainable development of Swasti Home Industry.

2. METHODS

The community service activity was taken place at Swasti Home Industry, located on Ahmad Yani Street, Subagan, Jasri Village, Karangasem District, Karangasem Regency, Bali Province. The partners consisted of the business owner and nine employees of Swasti Home Industry. The community service team responsible for addressing the partners' challenges has expertise in processing and packaging, with academic backgrounds in nutrition science and informatics engineering. Throughout the program, the partners were actively involved in identifying production problems, determining priority needs, participating in training and hands-on practice, evaluating program outcomes, and committing to independently applying the introduced appropriate technology after the completion of the program.

The method employed in this activity was participatory action research (Samsinas & Haekal, 2023; Siswadi & Syaifuddin, 2024), consisting of several sequential stages: problem identification, training and

mentoring, and monitoring and evaluation, as illustrated in Figure 3. During the problem identification stage, the partners and the community service team collectively analyzed production constraints and determined priority solutions. During the implementation stage, the partners directly practiced operating the provided equipment under the guidance of the community service team. This participatory approach ensured that the partners were actively engaged throughout the program, thereby strengthening their technical capacity and encouraging sustainable technology adoption.

The appropriate technology provided to the partner included an automatic dodol cooker and stirrer. The cooking process utilized energy from a gas stove, while the automatic stirrer operated using electricity at a constant rotational speed of 40 to 60 rpm. The use of the automatic stirrer reduced manual labor, thereby improving labor efficiency and increasing the productivity of dodol processing (Zainuddin et al., 2020). In addition, the community service team introduced a food dehydrator as a drying tool. The food dehydrator utilized heat energy from a gas stove, while electricity was used to power a blower that circulated heat evenly throughout the chamber (Rauf & Alamsyah, 2023). The community service team also provided standing pouch packaging and a hand sealer for the sealing process. The hand sealer, which operates using electricity, facilitates a faster and more convenient sealing process while ensuring a neat and hygienic finish (Kusumawati et al., 2024; Widyamurti et al., 2018). The standing pouch packaging used was made of aluminum foil without a zipper lock and had dimensions of 13 × 20 cm, while the provided hand sealer measured 42 × 8 × 12.5 cm.

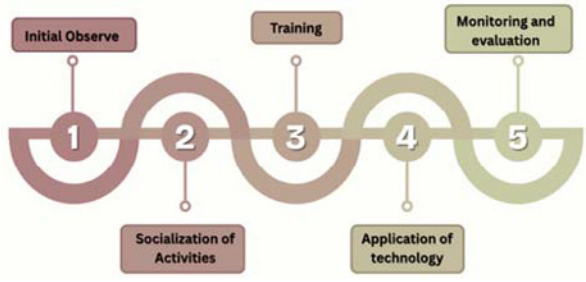


Figure 3. Stages of the community service method

The community service activities were conducted from March to August 2025 (Table 1). The program began with the identification of problems encountered by the partner. Based on the identified problems, the community service team discussed potential solutions and the appropriate technology to be provided. The stages of the community service activities, formulated based on the partner's challenges, are presented in Figure 4.

Prior to the training and mentoring sessions, the partner received a briefing regarding the community service program to be implemented. The effectiveness of the program was evaluated using pre-test and post-test assessments, direct observation, and practical performance evaluation. The written assessment consisted of ten questions covering four competency aspects: (1) Knowledge of jackfruit dodol processing; (2) Understanding of food drying techniques; (3) Packaging and food safety practices; and (4) Operation of the automatic cooker, food dehydrator, and hand sealer.

The practical evaluation was then conducted by observing the partners while they independently operated the equipment introduced during the program. The community service program was considered successful when the following indicators were achieved: (1) Improvement in the partners' knowledge and practical skills based on the pre-test and post-test results; (2) The partners' ability to independently operate the introduced appropriate technology; (3) Reduction in cooking and drying time; and (4) Improvement in product shelf life and production capacity.

Monthly monitoring was also conducted through on-site visits to evaluate the utilization of the provided equipment, the partners' ability to independently operate the technology, production continuity, product quality, and challenges encountered during implementation. The monitoring results were used to provide further technical assistance and assess the sustainability of technology adoption at Swasti Home Industry.

Table 1. Program implementation timeline

1st Activity	**Initial Observation**
Activity	Observe and identification of partner problems in Swasti Home Industry
Objective	Discuss the problems of processing jackfruit dodol
Partner Involvement	Identifying production problems
Expected Output	Priority problems identified
Implementation time	Third week of March 2025
2nd Activity	**Socialization of Activities**
Activity	Explained the upcoming work program, provided suitable technology equipment
Objective	The schedule of program implementation and activities was aligned with the intended
Partner Involvement	Attending the socialization session and providing feedback on the work program and scheduled activities
Expected Output	Understanding of the program timeline, agreement on activity implementation, and readiness to receive suitable technology equipment
Implementation time	Second week of June 2025
3rd Activity	**Jackfruit dodol preparation process**
Activity	Operating the automatic dodol cooker and stirrer
Objective	Producing of jackfruit dodol
Partner Involvement	Participating in lectures and demonstrations, operating the equipment
Expected Output	Knowledge improvement
Implementation time	Second week of July 2025
4th Activity	**Drying process for jackfruit dodol**
Activity	Practice drying dodol with a food dehydrator
Objective	Reducing the moisture of jackfruit dodol to improve shelf life
Partner Involvement	Participating in lectures and demonstrations, operating the equipment
Expected Output	Knowledge improvement
Implementation time	Second week of July 2025
5th Activity	**Packaging**
Activity	Using hand sealers to pack dodol into aluminum foil standing pouches
Objective	Increasing the shelf life of jackfruit dodol
Partner Involvement	Participating in lectures and demonstrations, operating the equipment
Expected Output	Knowledge improvement
Implementation time	Third week of July 2025
6th Activity	**Monitoring and evaluation**
Activity	Review partners' abilities in preparing and packaging of jackfruit dodol
Objective	Reviewing the challenges partners encounter in operating the provided equipment
Partner Involvement	Applying technology independently
Expected Output	Sustainable technology adoption
Implementation time	Second week of August 2025

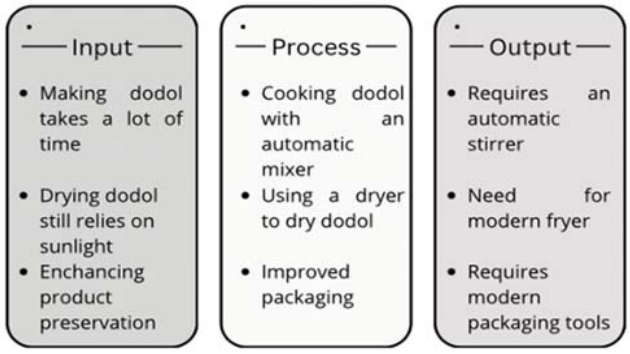


Figure 4. Stages of community service activities

3. RESULTS AND DISCUSSION

Initial Observation

The community service program began with an initial observation and field interview to identify the main challenges faced by Swasti Home Industry. The observation revealed that jackfruit dodol production was still carried out using conventional methods. The cooking process required approximately 4–5 hours, while the manual stirring process required significant physical effort while also potentially compromise product consistency. The conventional drying also relied on sunlight, taking 7–14 days depending on weather conditions, while also increased the risk of contamination and inconsistent product quality. Furthermore, the product was packaged using mica containers, resulting in a shelf life of approximately two months.

These production conditions limited production capacity, reduced product consistency, and made it difficult for the partner to meet increasing market demand during peak tourism seasons and religious holidays. The initial observation also served as the basis for determining the appropriate technology required by the partner.

Program Socialization

Following the initial observation, the community service team conducted a socialization session attended by the owner and employees of Swasti Home Industry. During this activity, the implementation schedule, program objectives, and appropriate technologies to be introduced were explained (Figure 5). The partners were also informed about the training, mentoring, monitoring, and evaluation activities to be conducted throughout the program. This activity ensured that both the community service team and the partners shared a common understanding of the implementation of the community service program.

Training and Application of Technology

Training activities were conducted through lectures, demonstrations, and hands-on practice. Prior to the training, the partners completed a pre-test to evaluate their initial knowledge of jackfruit dodol processing, drying, and packaging. During the training, the community service team introduced three appropriate technologies, including an automatic dodol cooker and stirrer, a food dehydrator, and a hand sealer for aluminum foil standing pouch packaging (Figure 6). The partners directly practiced operating each piece of equipment under the supervision of the community service team until they were able to use the technology independently.





Figure 5. Socialization activities
Figure 6. Appropriate technology provided to partners

Jackfruit Dodol Processing

The training on jackfruit dodol processing focused on the operation of the automatic cooker and stirrer (Figure 7). The equipment reduced the cooking time from 4–5 hours to approximately 1.5 hours (Figure 8). Consequently, the cooking process became more efficient, with a time reduction of 62.5–70 percent.



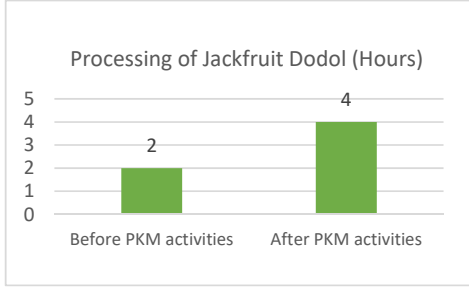


Figure 7. Training in making jackfruit dodol
Figure 8. Processing time for jackfruit dodol

Jackfruit Dodol Drying

The training on drying focused on the operation of the food dehydrator (Figure 9). Before the program, drying required 7–10 days under direct sunlight. Following the implementation of the food dehydrator, the drying process was completed within two days (48 hours). The reduction in drying time resulted in an efficiency improvement of 23.81 percent.



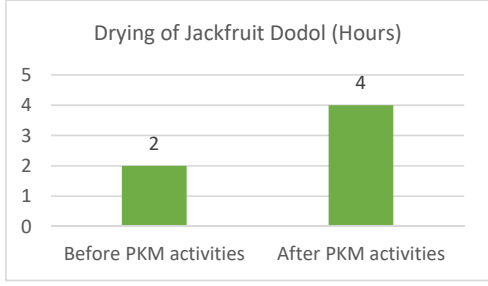


Figure 9. Training on drying jackfruit dodol
Figure 10. Drying time for jackfruit dodol

Jackfruit Dodol Packaging

The partners were trained to package jackfruit dodol using aluminum foil standing pouches sealed with a hand sealer. Prior to the program, the products were packaged in mica containers, with an estimated shelf life of two months. After implementation, the new packaging extended the shelf life to four months.



Figure 11. Training on hand sealer operation
Figure 12. Jackfruit dodol packaging before (a) and after (b) the community service activities

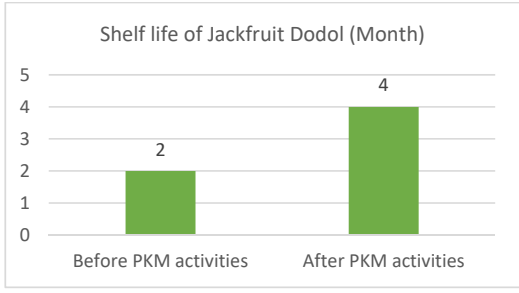


Figure 13. Shelf life of jackfruit dodol

Evaluation of Partner Competencies

The effectiveness of the training program was evaluated using pre-test and post-test assessments, as well as practical observations of the partners while operating the introduced equipment. The evaluation demonstrated improvements in the partners' knowledge and practical skills related to jackfruit dodol processing, drying, and packaging (Table 2).

Table 2. Partners' competencies before and after the program

Competency indicator	Pre-test (%)	Post-test (%)	Improvement (%)
Understanding jackfruit dodol processing	40	90	50
Operating automatic cooker	20	100	80
Operation food dehydrator	10	100	90
Packaging using hand sealer	30	100	70
Food packaging knowledge	35	95	60

The results showed that the partners demonstrated higher competency after participating in the training and mentoring activities. They were able to independently operate the automatic cooker and stirrer, food dehydrator, and hand sealer during the production process. The major outcomes of the community service program are summarized in Table 3.

Table 3. Summary of program achievements

Program indicator	Before	After	Impact
Cooking time	4-5 hours	1.5 hours	62.5-70 percent more efficient
Drying time	7-10 days	2 days	23.81 percent more efficient
Shelf life	2 months	4 months	Increased by 100 percent
Packaging	Mica container	Aluminum foil standing pouch	Better product protection
Partners' competency	Limited	Independent operation	Improved technical capacity

4. DISCUSSION

The implementation of appropriate technology effectively addressed the major production constraints experienced by Swasti Home Industry. The reduction in cooking time, initially from 4–5 hours to 1.5 hours, demonstrates that the automatic dodol cooker and stirrer substantially improved production efficiency by minimizing manual labor and maintaining continuous mixing throughout the cooking process. Likewise, replacing conventional sun drying with a food dehydrator reduced drying time from 7–10 days to two days and eliminated dependence on weather conditions.

In addition to improving production continuity, the application of aluminum foil standing pouch packaging extended the shelf life of jackfruit dodol from two to four months. These findings indicate that the introduced technologies successfully addressed the partners' main production bottlenecks while improving processing efficiency and supporting more consistent production. Similar results have been reported by Alit et al. (2019), Ansar et al. (2019), and Zainuddin et al. (2020), who found that appropriate technology significantly increased productivity and reduced processing time in small-scale food industries. Recent community empowerment programs have further demonstrated that integrating appropriate technology with management improvement can enhance MSME productivity, operational efficiency, and business competitiveness.

The application of appropriate technology also supported product quality and protection from potential contamination. Conventional sun drying exposed the product to dust, insects, and fluctuating environmental conditions, whereas the food dehydrator provided a more controlled drying environment that supported more consistent drying conditions. Likewise, replacing mica containers with aluminum foil standing pouches provided better protection against moisture, oxygen, and light, thereby extending product shelf life and helping maintain product quality during storage. Improved packaging can also enhance product appearance, potentially making it more attractive to consumers and increasing its market value. These findings are consistent with previous studies demonstrating that appropriate packaging not only functions as a protective barrier but also contributes to product quality, consumer acceptance, and marketing competitiveness (Manurung et al., 2023; Kusumawati et al., 2025).

The success of this community service program was not solely attributable to the provision of technological equipment, but also to the participatory implementation strategy adopted throughout the program. The participatory action research (PAR) approach allows partners to actively involved in identifying production problems, determining priority solutions, participating in training sessions, practicing equipment operation, and evaluating the outcomes of the program. This participatory process enabled the partners to gain both theoretical understanding and practical experience, contributing to greater confidence and independence in utilizing the introduced technology.

The improvement in partners' competencies observed through the pre-test, post-test, and practical evaluations indicates that technology transfer combined with continuous mentoring can be more effective than equipment assistance alone. Similar findings have been reported in previous community empowerment programs, which demonstrated that participatory learning and capacity-

building activities improve technology adoption and strengthen the operational capacity of micro, small, and medium enterprises (Fuadi et al., 2021; Orbawati et al., 2025; Surbakti, 2025).

Furthermore, the improvement in partners' technical competencies represents one of the most important outcomes of this program because sustainable community empowerment depends on the ability of beneficiaries to independently utilize the introduced technology after program completion. The pre-test and post-test results, together with direct observation during practical sessions, demonstrated that the partners were able to operate the automatic cooker, food dehydrator, and hand sealer independently. This achievement reflects successful technology transfer and indicates that the program strengthened human resource capacity in addition to improving production facilities. Capacity building is widely recognized as an essential component of community service because it enables partners to sustain innovation and continuously improve business performance.

The implementation of appropriate technology also generated positive implications for the economic development of Swasti Home Industry. Shorter production time enabled more efficient production scheduling and increased production capacity, while faster drying reduced production delays caused by unfavorable weather conditions. Moreover, the extended shelf life provides greater flexibility for product storage and distribution, thereby enabling the partners to better respond to consumer demand, particularly during periods of high tourist arrivals and Hindu religious ceremonies in Karangasem. Although the present program did not quantitatively evaluate changes in sales turnover, the improved production efficiency, enhanced product protection, and longer shelf life provide opportunities to expand market coverage and strengthen the competitiveness of the enterprise. These findings suggest that appropriate technology contributes not only to technical improvements but also to the potential economic development of small food enterprises.

Another important aspect of this community service program is sustainability. Monthly monitoring showed that the partners continued to utilize the automatic cooker, food dehydrator, and hand sealer during routine production activities and were able to operate the equipment independently without continuous assistance from the community service team. This finding indicates that the introduced technologies were successfully integrated into the partners' production system rather than being used only during the implementation phase. Continuous mentoring and periodic monitoring also enabled the community service team to identify operational constraints and provide technical guidance whenever necessary, thereby supporting the long-term sustainability of technology adoption.

Overall, this community service program demonstrates that integrating appropriate technology with participatory mentoring provides a comprehensive strategy for empowering small-scale food enterprises. The program generated measurable improvements in production efficiency and partners' technical competencies, while the introduced technologies also supported product quality, extended shelf life, and sustainable technology adoption. Therefore, this approach has considerable potential to be replicated in other home industries facing similar production constraints, particularly those relying on traditional food processing methods.

5. CONCLUSION AND RECOMMENDATIONS

The implementation of appropriate technology through an automatic dodol cooker and stirrer, a food dehydrator, and aluminum foil standing pouch packaging successfully improved the production performance of Swasti Home Industry. The program reduced cooking time from 4–5 hours to 1.5 hours, shortened the drying process from 7–10 days to 2 days, and extended the shelf life of jackfruit dodol from two to four months. In addition to improving production efficiency and supporting product quality, the participatory training and mentoring activities improved the partners' knowledge and technical skills,

enabling them to independently operate the introduced equipment. These improvements supported increased production capacity, provided opportunities to strengthen the competitiveness of Swasti Home Industry, and enabled the partners to better respond to market demand while supporting the sustainable adoption of appropriate technology for long-term business development.

This community service program was limited to improving production technology, packaging, and the partners' technical capacity, while its long-term economic impacts, such as changes in production volume, sales turnover, and market expansion, were not quantitatively evaluated. Therefore, several follow-up activities are recommended. First, periodic mentoring and monitoring should be continued to ensure the sustainable utilization and proper maintenance of the introduced equipment. Second, future community service activities should include financial management training to support cost and profit analysis, as well as digital marketing training to strengthen business management and expand market access. Third, product diversification training should be provided to expand the variety of jackfruit-based products, increase product value, and strengthen business competitiveness. Finally, long-term evaluation of production performance and economic indicators is recommended to comprehensively assess the sustainability and impact of the program on MSME development.

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