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Enriching papaya' s value-added through community-oriented food processing training

Reni Untarti[1], Agung Nugroho[2], Cicih Wiarsih[2]

[1]Department of Mathematics Education, Faculty of Teacher Training and Education,
[2]Department of Elementary School Teacher Education, Faculty of Teacher Training and Education,
University of Muhammadiyah Purwokerto
Jl. KH. Ahmad Dahlan, Purwokerto, Central Java 53182, Indonesia

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ABSTRACT

Papaya represents one of the most abundant agricultural commodities in Dukuh Ceger, Linggasari Village, Banyumas Regency. However, its utilization remains limited to direct consumption, resulting in relatively low commercial value, particularly during harvest seasons. This community service program aimed to improve local communities by enhancing their capacity to process papaya into value-added food products. The program adopted a participatory approach through training, hands-on practice, mentoring, and evaluation. A total of 35 participated in the training, which focused on producing papaya candy, papaya chips, and papaya pudding. Pre-test and post-test assessments was conducted for evaluation, demonstrating a significant increase in participants' understanding across several aspects, including processing techniques, product diversification, and commercial value. The results demonstrated various improvements, particularly 31 percent increase in product knowledge, 66 percent increase in understanding commercial value, 51 percent increase in processing skills, and 63 percent increase in perceived community benefits. In addition, 86 percent of participants actively engaged during the activities, and the average satisfaction score reached 4.64 on a 5-point scale. These findings demonstrate that the program effectively improved participants' knowledge and practical skills, while also increasing awareness of papaya's commercial value potential. The program contributes to strengthening community capacity and opens opportunities for developing sustainable, locally based business initiatives.

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1. INTRODUCTION

Papaya (Carica papaya L.) is a fruit predominantly grown in tropical area, including Indonesia, and has many benefits for daily life (Ávila et al., 2020; Koul et al., 2022; Shaheen et al., 2022). In addition to being directly consumed as fresh fruit, papaya can also be processed into various useful products. For example, papaya peel can be used as organic fertilizer to improve soil fertility, while papaya seeds can be processed into flour that contains high fiber and protein (Ávila et al., 2020; Dahunsi et al., 2021, Joshi et al., 2025). However, in many communities, the use of papaya is still limited to direct consumption or simple traditional products, consequently limiting its commercial value potential.

Dukuh Ceger, located in Linggasari Village, Kembaran District, Banyumas Regency, is an area where the majority of residents work in agriculture, including papaya farming. Papaya is widely cultivated in

✉ Corresponding Author: **Reni Untarti**: Tel. +62 281 636751 | E-mail: reniuntartiump@gmail.com

this area because it grows easily and adapts well to local environmental conditions. However, farmers in Dukuh Ceger face several challenges. During the harvest season, the amount of papaya crops increases significantly, causing the selling price to decline sharply, sometimes falling below IDR 1,000 per kilogram. Additionally, farmers also face problems such as plant diseases, limited knowledge of proper cultivation and maintenance, uncertain weather conditions, and limited access to wider markets.

Another major issue is that papaya is generally marketed only as fresh fruit which naturally does not last long and is easily expired. This condition often causes losses for farmers, especially when the harvest is abundant and distribution is limited. Therefore, there is a need for efforts to process papaya into products that last longer and have higher commercial value.

One possible solution is to process papaya into various innovative food products, such as papaya candy, papaya chips, and papaya pudding. These products are not only last longer but also have better selling value and attract broader consumers. Papaya candy, for example, can be an alternative snack that is rich in fiber and suitable for children who dislike fruit (Pratiwi et al., 2023). Papaya chips are made from unripe papaya and processed into a savory-flavored snack, while papaya pudding can be marketed as a modern and affordable dessert (Jannah et al., 2026; Santi et al., 2021).

Based on the identified problems and local potential, this community service program aims to empower the community of Dukuh Ceger through participatory training in processing papaya into value-added products, namely papaya candy, papaya chips, and papaya pudding. This program is expected to enhance community capacity, improve the commercial value of local commodities, and support the development of sustainable, community-based business opportunities.

2. METHODS

This community service activity adopted a production process training approach, primarily targeting 35 papaya farmers in Dukuh Ceger. The goal is to provide training in processing papaya into innovative products, specifically papaya candy, papaya chips, and papaya pudding, to increase papaya's commercial value.

Activity of Community Service

Preparation stages

At this stage, several preparatory activities were carried out to ensure the effective implementation of the program. First, various conditions were observed to understand the potential and challenges of program implementation, including the availability of papaya raw materials, the enthusiasm of the community, and the identification of appropriate strategies to maximize the effectiveness and positive impact of the program. Next, related to permitting and engagement process, which included obtaining activities' approval from the head of the neighbourhood association (RT), gaining permission to use the required facilities, and coordinating community involvement in the training activities. In addition, pre-test and post-test instruments were prepared to measure improvements in participants' knowledge and practical skills, along with participant satisfaction instruments to evaluate their responses to the training program. The pre-test and post-test each consist of 15 questions, as shown in Table 1.

The participant satisfaction questionnaire consisted of 15 statements measured using a 5-point Likert scale, as presented in Table 2, where higher scores indicate more positive responses. The questionnaire was used to evaluate participants' perceptions of the training materials, delivery, facilities, overall satisfaction, and interest in similar future activities.

Table 1. Pre-test and post-test grid

Indicators	Item Number	
	Pre-test	**Post-test**
Purpose of Papaya Processing	2, 7, 11	3, 7, 11
Types of Papaya Products	3, 12, 14	1, 4, 6
Commercial Value of Papaya	1, 4, 5,	10, 13, 14
Processing Stages	8, 9, 15	2, 5, 9
Impact on the Community	6, 10,13	8, 12, 15

Table 2. Participant satisfaction questionnaire grid

Indicators	Item Number
Suitability of the training to the participants' needs	1, 4
The clarity of the resource person in presenting the material	2, 7
The adequacy of training time	3, 5
Training support facilities	9, 15
The relevance and recentness of the information obtained from the training	6, 13
Participant satisfaction with the training	8, 11
Participants need similar training	12, 10, 14

Table 2 shows the indicators used to measure participants' satisfaction with the training program. The questionnaire covering several aspects, including the relevance of the training to participants' needs, the clarity of material delivery, the adequacy of training time, the availability of supporting facilities, the usefulness of the information provided, overall satisfaction, and participants' interest in similar training activities in the future.

Implementation stages

The training was conducted in stages: (1) A pre-test to measure participants' understanding and skills regarding papaya processing prior to the training; (2) Offline training to produce papaya candy, papaya chips, and papaya pudding; and (3) A post-test to measure participants' understanding and skills regarding papaya processing after the training.

Monitoring stages

Monitoring was carried out throughout and after the training activities to ensure active participant involvement and the effective transfer of knowledge and practical skills. During this stage, the service team directly observed participants' attendance, engagement, and ability to independently practice each papaya processing technique. In addition, follow-up mentoring and discussions were conducted to identify difficulties encountered by participants during the production process, provide immediate feedback, and ensure that the acquired skills could be applied independently. Monitoring was also intended to assess participants' readiness to utilize the acquired skills as potential household-based business opportunities.

Evaluation stage

The final stage was evaluating the program's success. This evaluation was conducted through feedback obtained from training participants, the level of success in processing the products, and the potential for utilization/development as business opportunities. The evaluation results were compiled into a report to document the activity and to inform the development of similar programs in the future. The indicators for the success of this activity are: (1) At least 75 percent of participants actively participate in the activity; (2) There is an increase in participants' understanding and skills as indicated by an increase in pre-test to post-test scores for each indicator; and (3) Average participant satisfaction score of at least 4.00 (scale 1-5). The general activity of Community Service for this activity, as shown in Figure 1.

Figure 1. Activity stages of community service

3. RESULTS AND DISCUSSION

Results

Participant profile

The main objective of this activity is to provide training to the Dukuh Ceger community in processing papaya into long-lasting, high-value foods. These foods include papaya candy, papaya chips, and papaya pudding. This process can be done individually or in groups, enabling them to solve their own problems and maximize their potential to improve their quality of life. During the observation stage, the implementation team visited Dukuh Ceger to identify the community's problems. The training location was in Dukuh Ceger, RT. 02/RW. 06, Linggasari Village, Kembaran District, Banyumas Regency, Central Java Province. In this training, the community learned how to process papaya into innovative, commercially valuable, and long-lasting foods: papaya candy, papaya chips, and papaya pudding. Thirty-five participants from the PKK (Family Welfare Movement) in Dukuh Cagur attended the training. The schedule is shown in Table 3.

Activity output

The goal of this training activity is to improve the Dukuh Ceger community's skills in processing papaya into long-lasting, commercially valuable products. Specifically, papaya is processed into papaya candy, papaya chips, and papaya pudding. The training activity begins with making papaya candy.

The candy-making process begins by peeling, grating, filtering the papaya, and cooking it under medium heat with sugar and agar powder to create a thick mixture. The mixture was then poured into molds, colored (optional), shaped, coated with sugar, and left to set before being ready for consumption. Figure 4 shows training on processing papaya into papaya candy, with the community actively participating. Figure 5 shows papaya candy making process by the participants.

The next product was papaya chips, as shown in Figure 6. The process began by peeling and grating the papaya, followed by salting and thoroughly draining the excess water. The papaya was then coated with seasoned flour, separated evenly, and fried until golden brown. After draining and cooling, the papaya chips were ready for packaging, as shown in Figure 7.

Table 3. Training activity meeting schedule

Meeting 1	**April 12th, 2025**
Activity	- Introduction of the implementation team - Explanation of the objectives of the activity by the implementation team - Explanation of the implementation method, tools, and required materials
Objective	- Ensure the objectives of the activity and the introduction of implementation team are conveyed - Participants understand the implementation methods, tools, and materials required
Meeting 2	**April 27th, 2025**
Activity	- Papaya Candy Making Training
Objective	- Improving participants' skills in processing papaya into papaya candy.
Meeting 3	**May 4th, 2025**
Activity	- Papaya Chip Making Training
Objective	- Improving participants' skills in processing papaya into papaya chips.
Meeting 4	**May 4th, 2025**
Activity	- Papaya Pudding Making Training
Objective	- Improving participants' skills in processing papaya into papaya pudding.
Meeting 5	**May 18th, 2025**
Activity	- Evaluation
Objective	- Gaining participants responses to the training provided and ensuring the sustainability of the training.

Figure 4. Papaya candy making process
Figure 5. Papaya candy

Figure 6. Papaya chips making process
Figure 7. Papaya chips

Another food product prepared in this training is papaya pudding. To prepare the pudding, the papaya was initially blended and cooked with jelly powder, sugar, salt, water, and condensed milk until boiling. The mixture was then poured into a container, layered with a second cooked mixture, and left to set for 1–2 hours before being cut and served, as shown in Figure 8, with the final product presented in Figure 9.

Figure 8. Papaya pudding making process
Figure 9. Papaya pudding

Based on the pre-test results with the instrument grid according to Table 1, it was found that the skills of the Dukuh Ceger Community in processing papaya were below expectations, the pre-test results showed that all indicators were below 50 percent according to Figure 10.

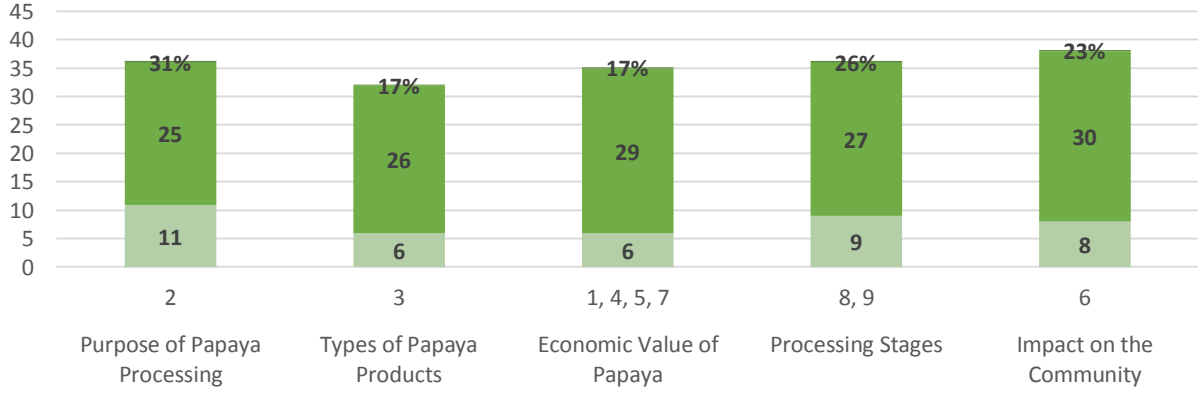

Figure 10. Pre-test results

After the training, as shown in Figure 11, understanding of the Dukuh Ceger Community increased, as indicated by higher post-test scores, ranging from 40 to 66 percent.

Figure 11 shows that all indicators increased significantly from the pre-test to the post-test. Proving the training's effectiveness in improving participants' understanding of papaya processing. Based on monitoring conducted through observation, 86 percent of participants actively participated in the activities. Indications include: (1) Arriving on time and following the activity until completion; (2) Focusing on listening to the speaker's presentation; (3) Actively asking questions, answering, and providing feedback; and (4) Showing interest by taking notes, nodding, or making eye contact.

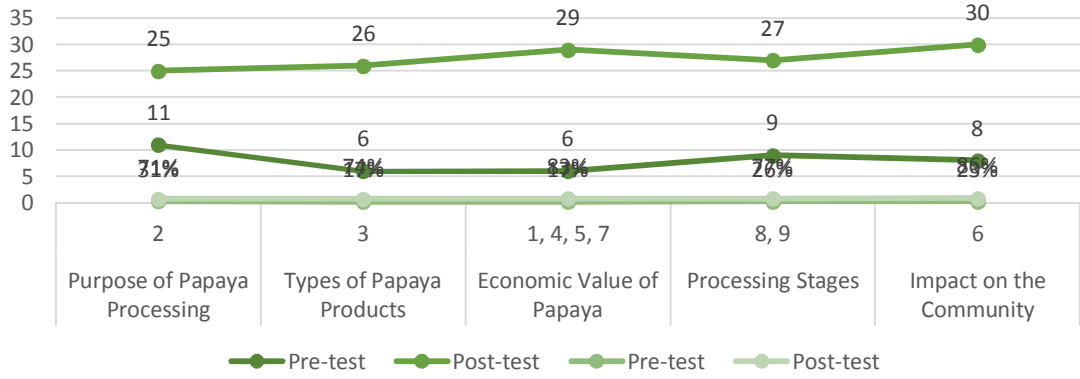

Figure 11. Comparison of pre-test and post-test

Evaluation

This training evaluation was conducted by delivering a questionnaire to 35 participants. The questionnaire including 15 items, with 5-points Likert scale indicating positive responses for higher scores. The questionnaire results in Figure 12 show that for each indicator, the average participant satisfaction score was above 4.00. These quantitative results indicate that the participants were generally satisfied.

Overall, the training received very positive responses from participants across all aspects of the evaluation, suggesting the potential sustenance of the training activities. Figure 12 shows that indicator A relates to the suitability of the training to the participants' needs; B relates to the clarity of the resource person in presenting the material; C relates to the adequacy of training time; D refers to training support facilities; E relates to the relevance and recentness of the information obtained from the training; F relates to participant satisfaction with the training; and G refers to participant needs for similar training.

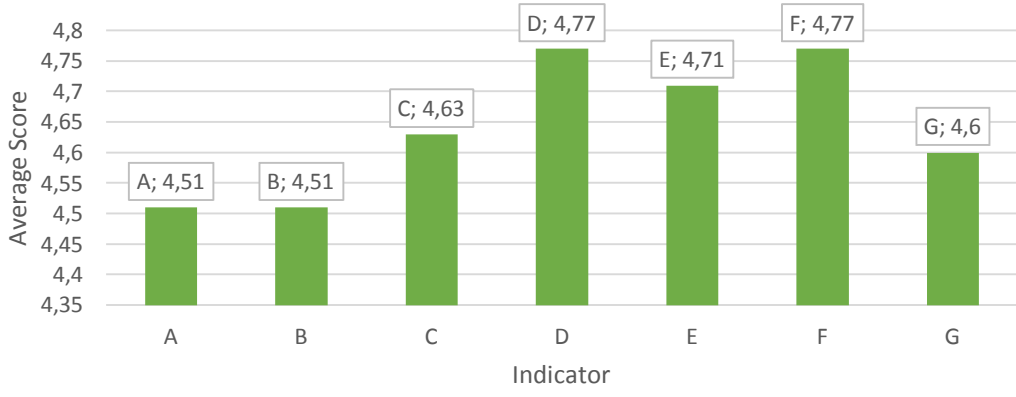

Figure 12. Satisfaction questionnaire results

Additionally, interviews with five randomly selected participants were conducted as part of the evaluation. Interview results suggest that the community was satisfied with the training because it addressed their needs. Participants also expressed the need for further training with a longer duration, particularly on product packaging and marketing, including social media marketing.

Discussion

The pre-test and post-test results showed a significant increase in participants' understanding of the diversification of processed papaya products, including knowledge of commercial value, product varieties, and the impact for the community, particularly papaya farmers. These results hold strategic significance, as they not only improve knowledge but also demonstrate a process of economic empowerment through the utilization of local potential. Papaya, which previously limited for direct consumption, now can serve as a resource that can be processed into value-added products.

The increased understanding of the product's commercial value indicates that participants began to recognize the importance of innovation in business development, including processing papaya into various food products. Certain food processing methods can potentially increase commercial value, extend shelf life, and reduce food loss (Diamonda et al., 2025, Michel et al., 2024). Thus, agricultural product processing, including foods, is a key strategy for increasing rural communities' economy (Kamakaula, 2024). The increase the commercial value of agricultural products managed by the local community will positively impact the community's income and welfare, especially for farmers cultivating crops, including papaya (Malek et al., 2024).

From a community empowerment perspective, participants' increased understanding of the papaya processing demonstrates the potential to foster economic independence. Empowerment not only involves increasing individual capacity but also the community's ability to manage local resources productively. Strengthening community capacity through agricultural processing can encourage inclusive and sustainable economic growth (Okafor et al., 2025). In other words, the local agriculture industries can increase household incomes and strengthen village economic structures.

The focus on skills-based training was also crucial to the program's success. Participants' increased understanding demonstrates that the practical-based training approach can help the transfer of skills become relevant to community needs, evidenced with the results evaluation of this activity. In the context of papaya processing, technical skills and innovative ideas are key to products' potential commercial value. Technical skills and innovation in the production process and packaging design also influencing the product quality, thereby increasing market competitiveness (Leni et al., 2026; Rosi et al., 2025). Additionally, diversification of processed papaya products opens up opportunities for communities to develop small businesses that are well-adapted to market needs. The development of locally produced agricultural products is necessary for local economic transformation, as it enhances both competitiveness and sustainability (Indreswari et al., 2024).

However, the suboptimal results observed in several aspects indicate the need for more targeted future solutions. Challenges such as limited access to technology, product innovation, and marketing networks also hinder the development of local papaya-based commercial value potential. Therefore, a sustainable approach is needed that focuses not only on initial training but also on business mentoring and strengthening market access.

To summarize, the results of this activity demonstrate that processing papaya into value-added products not only increases knowledge but also serves as a strategic tool for community empowerment, skills development, and economic development based on local potential. With continued support, this activity suggests the potential to become a model for inclusive and competitive local economic development.

4. CONCLUSION AND RECOMMENDATIONS

A significant increase in community capacity to process papaya into candy, chips, and pudding is reflected by score increase across all indicators. Participants' understanding of: processing papaya

into various food products increased from 31 to 71 percent, product varieties from 17 to 74 percent, commercial value from 17 to 83 percent, processing stages from 26 to 77 percent, and impact on the community from 23 to 86 percent. Furthermore, monitoring observations indicated that 86 percent of participants actively participated in the activities. These indicators included: (1) Arriving on time and following the activity until completion; (2) Focusing on listening to the speaker's presentation; (3) Actively asking questions, answering, and providing feedback; and (4) Showing interest by taking notes, nodding, or making eye contact. Evaluation results showed that the average score for all participant satisfaction indicators was above 4.00. This indicates that participants were satisfied with the training and had a positive impact on increasing their capacity to process papaya into commercially valuable foods. The results also suggest that the community is beginning to understand the potential of papaya as a value-added commodity, while simultaneously acquired basic processing skills. Consequently, this opens up opportunities to develop businesses based on local potential and to increase commercial value through product diversification. Overall, these activities increase community capacity and skills while simultaneously opening up potentially sustainable local economic opportunities by utilizing local resources.

This training has several limitations. First, the relatively short observation period means the concrete economic outcomes or impacts are not yet observed. Second, because participants do not have equal access to resources, including capital, time, and materials, the result of the program are not evenly distributed. Third, the data collected remain limited to evaluation results from pre- and posttests and are not yet supported by real-world indicators such as production output or sales performance. Based on the results, several recommendations can be proposed. First, follow-up mentoring should be conducted periodically and focused on ready participants, especially in packaging, basic licensing, and simple marketing. Second, training should be delivered in short and practical sessions, particularly on basic business management and simple digital marketing tools. Third, it is important to optimize existing facilities and introduce affordable equipment that participants can easily adopt. Fourth, similar programs should be implemented selectively in areas with strong local potential and readiness. Finally, ongoing collaboration between universities, local government, and the community should be maintained with sustainability in consideration.

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