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Empowering Rural Housewives Through Creative Packaging Design: The Case of Beneng Taro Products in Juhut Village, Banten

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ABSTRACT

Background: This community service program was conducted in Juhut Village, Pandeglang, Banten, to address limited market access of Beneng taro-based food products produced by local housewives. Despite abundant raw materials, product competitiveness remains low due to unsafe processing practices and poor packaging design.
Contribution: This program bridges the gap between product quality and consumer trust by integrating food safety education with creative packaging innovation. It offers a participatory model that strengthens visual identity, labeling compliance, and branding for rural microenterprises.
Method: The program applied a participatory approach involving 20 local women from the Sendaloka group. Activities included technical training on oxalate reduction techniques, visual communication in packaging, and safe food processing.
Results: The initiative led to the development of Talaschips, a branded Beneng taro chip product with complete labelling, health claims, and consumer-oriented design. Evaluation showed a 65% increase in knowledge based on post-training interviews, and more than 30% of participants expressed intent to register their products for food certification.
Conclusion: The program effectively empowered rural women by improving their technical and design capabilities. It fostered self-recognition as legitimate entrepreneurs and improved market access for local food products. The model is scalable and can be adapted to other rural settings for inclusive economic development and gender-equitable entrepreneurship.

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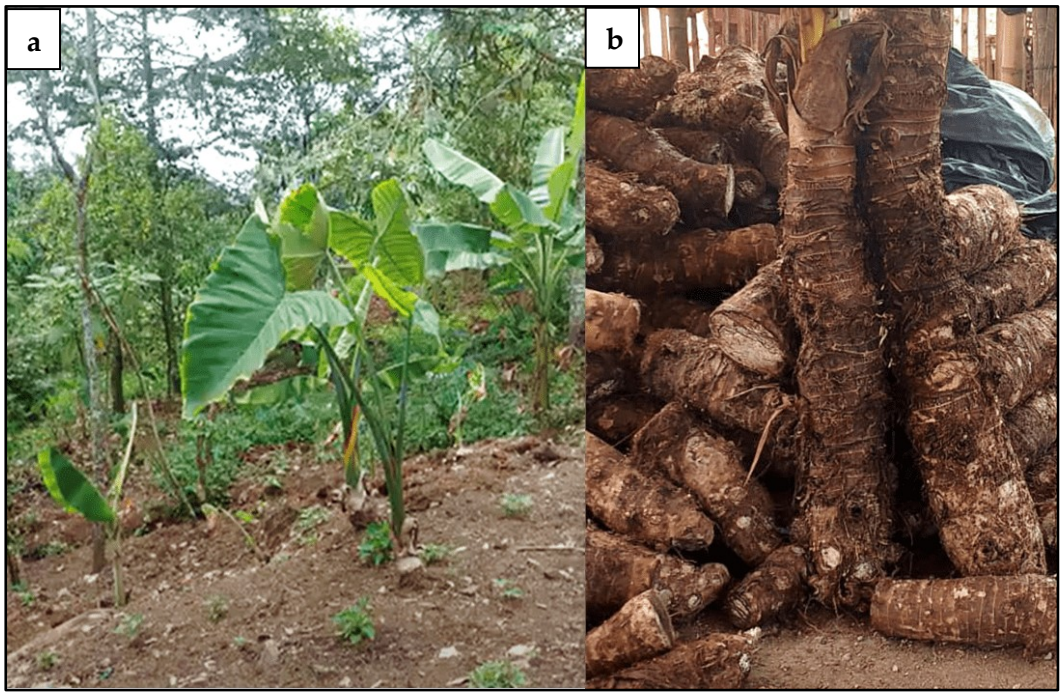
1. Introduction

Banten Province, particularly Pandeglang regency, possesses abundant natural resources that can be developed into community-based economic opportunities. Among its local commodities, Beneng taro (Xanthosoma undipes K. Koch) is a high-potential crop due to its yield and nutritional profile [1]–[4]. Pandeglang is the largest cultivation area of Beneng taro in Indonesia, covering over 700 hectares, with a significant increase in production over the past decade [5], [6]. Figure 1 illustrate the physical characteristics of Beneng taro cultivated in Pandeglang, including its large green leaves, upright stems, and harvested tubers.



(a) Beneng taro plants (b) harvested Beneng taro

Figure 1. Beneng taro (Xanthosoma undipes K. Koch) cultivation in Pandeglang Redency

Due to its unique chemical and physical properties, Beneng taro has drawn attention in various scientific studies for its starch content. It has promising potential in advanced material applications, and utility in environmentally friendly packaging materials [7]–[10]. Beneng taro also has been identified as potential material for conversion into nutritious and economically advantages functional food, such as noodles [11], [12], bread [13], artificial rice [10], [14], [15], and additive to other processing food [16]–[19]. Despite its potential, Beneng taro remains underutilized in local economic activities.

Juhut village is one of the key centers of Beneng taro production in Pandeglang in Figure 2. Many women are engaged in micro-scale processing but lack access to training in food safety, standardized processing, and packaging design. Most products are sold with minimal or unsafe packaging, using generic containers without labels, expiry dates, or nutritional information [20]. This weakens consumer trust and limits market expansion, particularly beyond informal local sales.

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Figure 2. Signed and digital maps of Juhut Village from Engineering Faculty of Untirta

Packaging is not merely a protective layer; it plays a critical communicative role in shaping consumer perception, branding, and compliance with regulatory standards. Studies have shown that well-designed packaging significantly enhances product attractiveness, conveys legitimacy, and influences purchase decisions [21]–[24]. It has shown that visually engaging and functionally sound packaging significantly boosts consumer purchasing behaviour, especially in snack foods and other processing food [25]–[29]. Bou-Mitri et al. and Wang et al. highlight how visual attributes such as colour, typography, labelling, and material affect consumer trust, perceived healthiness, and willingness to pay [30], [31].

Many empowerment programs for rural women overlook packaging as a strategic component, focusing instead on food hygiene or business mentoring. This community service initiative addresses that gap by combining scientific training in oxalate reduction techniques with creative packaging development. By integrating visual communication, labelling compliance, and low-cost design strategies, the program seeks to empower rural women not only technically but also through self-representation and market identity.

Different from previous studies which focusing solely on either technical or business elements, this program integrates visual communication design as a strategic and participatory tool to enhance women's entrepreneurial capacity. By linking product quality with presentation and branding, the program aims to improve both market access and self-perception among rural women microentrepreneurs. The implementation is expected to contribute not only to income generation of Juhut village community but also to the long-term sustainability of local food entrepreneurship.

2. Method

This community service program adopted a participatory empowerment model, which emphasizes community involvement at every stage to ensure local relevance and sustainability.

The approach was structured into five key phases:

1. preliminary assessment,
2. technical training on food processing,
3. creative packaging training,
4. mentoring and prototyping,
5. evaluation and follow-up.

This structure aligns with established frameworks for community-based intervention that promote active learning and capacity-building. This program was implemented over four months period, with a total of six sessions, each lasting approximately 3-4 hours. These sessions included both discussion and practical components, facilitated by Untirta's lecturers and student volunteers.

2.1. Preliminary Assessment and Community Mapping

Engagement started with coordination meetings and focus group discussions (FGDs) involving village leaders, women's group Sendaloka, and youth representatives. These sessions identified key challenges and assets, ensuring contextual relevance of training content.

2.2. Technical Training on Safe Food Processing

The first training session focused on food hygiene and oxalate reduction methods. Sessions were designed using participatory training techniques, including demonstrations, group discussions, and guide hands-on practice. The facilitators introduced the topic using visual slides and infographics about food safety hazards and their health implications.

The practical demonstration covered the NaCl soaking technique, rinsing, drying, and subsequent processing into taro chips. Each participant was guided step-by-step through the procedure. It allowed for immediate practice, peer feedback, and correction of common errors, ensuring deep learning and retention.

2.3. Creative Packaging Training

The second training session introduced participants to the basics of visual communication, material selection, and product labelling. The session covered:

1. Roles of packaging in food safety, branding, and shelf-life extension.
2. Selection of materials (e.g., aluminum foil pouches, food-safe plastic).
3. Labelling elements, including product name, expiry date, nutrition facts, and halal logo.
4. Basic visual communication principles, including color psychology and layout.

2.4. Mentoring and Prototyping

Following the training, participants received individual mentoring during the prototyping phase. Student volunteers supported each household in implementing packaging revisions, improving product presentation, and preparing for market testing.

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2.5. Evaluation and Monitoring

Evaluation of the program was conducted to assess participants knowledge acquisition, practical application, and potential for sustainability. A combination of qualitative and observational methods was used to ensure a comprehensive understanding of participants' progress. The primary evaluation activity was a series of semi-structured interview sessions conducted before and after the trainings. These interviews aimed to assess the participants' baseline and post-training knowledge regarding food safety practices and packaging design principles. Interview questions were designed to capture both cognitive understanding and perceived confidence in applying the methods learned.

Reflection forms were used to capture feedback on training clarity and relevance. Monitoring visits were conducted to observe real-time application, with several participants showing independent implementation and group-based collaboration for future branding.

3. Results and Discussion

3.1. Participation and Skill Development

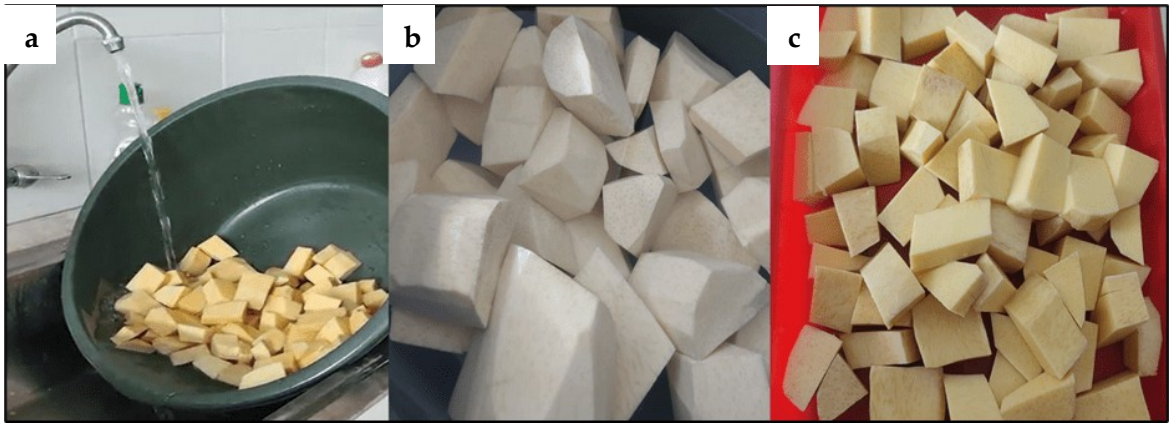
The community service program was attended by 20 housewives from Juhut Village who actively engage in home-based food processing in Figure 3. Most of the participants were members of Kelompok Wanita Tani Sendaloka (Sendaloka Women's Group), which is known for producing traditional food product from Beneng taro. Most participants had limited formal education but demonstrated strong community ties and readiness to engage in hands-on learning. The training was facilitated by three faculty mentors and supported by 10 student volunteers, fostering an inclusive and interactive learning environment. Participants transitioned from passive recipients to active learners, reflecting improved confidence in managing food safety and packaging processes.

Figure 3. Group photo of participants in the 2025 Community Service Program held in Juhut Village, Pandeglang

3.2. Oxalate Reduction Training and Food Safety Impact

The oxalate reduction training began with the preparation and weighing of Beneng taro tubers. Each participant was instructed to measure 1 kilogram of raw taro using a standard kitchen scale to ensure uniformity in treatment. The tubers were then peeled carefully to remove the outer skin and washed thoroughly with clean water. This initial cleaning process was essential to eliminate surface impurities and prepare the taro for the oxalate reduction stage.

The peeled taro was then soaked in a 10% w/w salt (NaCl) solution for 1 hour. This method scientifically recognized to reduce soluble oxalate compounds. After the first soaking, the taro was rinsed again and re-soaked in plain water for 30 minutes to remove excess salt and residual oxalates. Finally, the taro was drained and allowed to air-dry. This multi-stage soaking process was demonstrated and practiced directly by participants to ensure proper understanding and application. The hands-on nature of this activity allowed participants to observe changes in texture and taste, reinforcing the effectiveness of the oxalate reduction technique. The cleaning and soaking process, including the post-soaking result of Beneng taro has shown in Figure 4.



(a) Washing peeled taro cubes under running water (b) Soaking taro in solution to reduce oxalate content (c) Drained and cleaned taro ready for further processing.

Figure 4. Stages of Beneng taro preparation during oxalate reduction training

The oxalate reduction training improved both technical skills and product safety awareness. Before the training, most participants were unaware of the chemical nature of oxalates and their potential to cause throat irritation and kidney stones. After completing the sessions, participants were able to demonstrate two safe and effective oxalate reduction techniques using saline soaking. It confirms that low-cost scientific interventions, when delivered through participatory learning, are highly transferable and sustainable.

3.3. Creative Packaging Training and Product Transformation

Packaging, when combined with visual appeal and functional protection, acts as a powerful tool to influence purchasing decisions [26], [32]. The creative packaging training addressed key gaps in product presentation and market readiness. Initially, participants used

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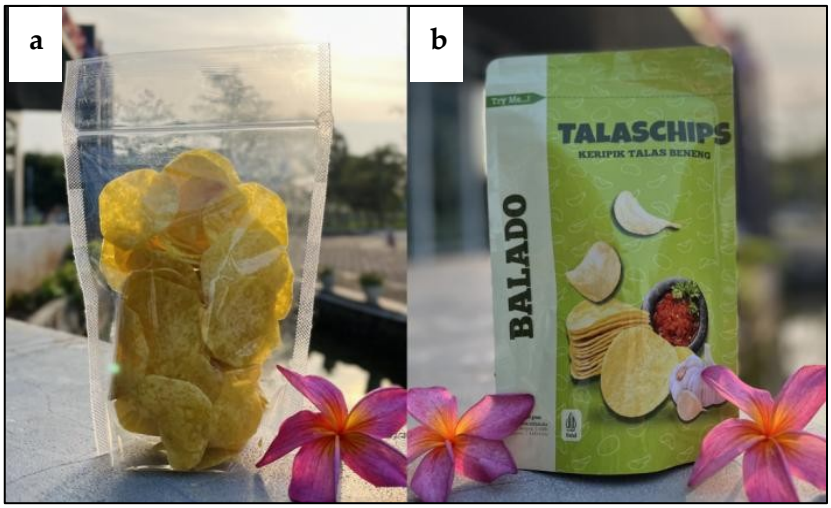
generic zip-lock bags with no branding or nutritional information. As seen in Figure 6, through the training, they co-designed branded packaging labelled Talaschips. It is featuring visual identity, health claims, halal placeholders, and barcodes in Figure 5.



(a) Original transparent zip lock packaging without branding (b) Newly designing "Talaschip"

Figure 5. Comparasion of Beneng taro chip packaging.

The back panel of the new packaging prominently features a "Try Me!" tagline, which is an example of call-to-action design aimed at increasing consumer curiosity and purchase intent (Fig. 6). Moreover, the label contains structured nutritional claims, such as "Gluten Free", "Low Glycaemic Index", "High Fibber", and "Complex Carbohydrates". Each claim is supported by short explanations and simple icons, enhancing consumer comprehension at a glance. The use of iconography and concise descriptors indicates that participants were able to apply information hierarchy and icon-based learning.

The composition section clearly lists ingredients in simple terms, while the inclusion of "Best Before" placeholder space prepares the product for compliance with future food safety standards. The barcode and social media handle further demonstrate s shift towards digital readiness and traceability, key factors in accessing wider markets. The inclusion of a producer address and group name (Sendaloka Group) also indicates transparency ang strengthens brand accountability.

This redesign improved perceived product quality and positioned the participants as legitimate producers. The packaging became a tool not only for compliance, but also for self-representation, reinforcing their identity as entrepreneurs rather than informal food preparers. It aligns with the finding of Bou-Mitri (2021) and Ghorbani (2025), who highlight the link between visual packaging, consumer trust, and producer confidence [28], [30]. In a rural entrepreneurship context, visual design literacy supports empowerment by allowing producers to communicate product value directly to consumers.

3.4. Evaluation Results and Empowerment Indicators

Evaluation was conducted through pre- and post- interviews, direct observation, and reflection forms in Figure 7. Group discussions were also conducted to capture participants

feedback regarding the clarity of instruction, the usefulness of the materials, and perceived changes in their confidence and capabilities. Results showed 65% increase in knowledge of food safety and packaging design. Furthermore, 30% of participants expressed interest in registering their product under PIRT licence and halal certification. This demonstrates not only cognitive gains but also attitudinal shifts, such as increased self-confidence, proactive behavior, and perceived legitimacy.

Figure 6. Back view of the Talaschips packaging (left) and a zoomed-in view of the product information label (right).

Figure 7. Evaluation and monitoring session of the training activity with the women's group in Juhut Village, Pandeglang.

The activities outcomes are consistent with the gendered entrepreneurship framework, which highlights the importance of confidence-building, identify transformation, and

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improved access to markets as central dimensions of women empowerment. It shows how integrating visual communication and packaging design into community-based training can foster more holistic and sustainable empowerment. The participatory approach implemented in this program offers a replicable model that can be adapted to other rural contexts where women face similar structural limitations. Future efforts should consider the strategic role of packaging and communication design not merely as technical enhancements. Instead, they should be recognized as empowerment tools that support inclusive growth, entrepreneurial legitimacy, and gender-equitable economic participation.

4. Conclusion

This community service program demonstrated that integrating food safety training with participatory packaging design can significantly enhance the entrepreneurial capacity of rural women. The development of the Talaschips packaging not only improved product safety and market readiness, but also fostered a shift in self-perception from informal food processors to confident microentrepreneurs.

The results showed clear cognitive and behavioral improvements, including increased knowledge of food hygiene, design literacy, and interest in formal certification. The participatory approach encouraged ownership and sustainability through peer collaboration, mentoring, and iterative learning. This model provides a scalable framework for community empowerment, particularly in rural settings where women face structural barriers to economic participation. Future programs should consider expanding this approach with digital marketing support and post-certification assistance to maximize long-term impact and ensure continuity of empowerment outcomes.

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