

Empowering Rural Women through Packaging Innovation and Business Training for Coconut Shell Biomass Briquettes

Jauharatul Wardah^{1*}, Adi Priansyah², Sarah Rachel³

^{12,3}Department of Industrial Engineering, Faculty of Technology and Engineering, Universitas Sunan Gresik, Gresik, Indonesia

*Corresponding author: jauharatul.w@lecturer.usg.ac.id

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Abstract

Rural communities often face challenges in increasing the market value of locally produced goods when packaging capabilities and basic business-management skills are limited. Coconut-shell biomass briquettes have potential both as a renewable-energy product and as a means of utilizing locally available biomass residues. This community engagement program aimed to strengthen the capacity of a rural women's group in packaging innovation and basic business-feasibility analysis for coconut-shell biomass briquettes. The program was conducted in Karangcangkring Village, Dukun District, Gresik Regency, East Java, on 23 May 2026 and involved 22 members of a women's community group. A participatory approach combined interactive lectures, demonstrations, hands-on packaging design using Canva, group discussions, and practical exercises in calculating the cost of goods manufactured, setting selling prices, estimating profit, and determining the investment payback period. Program evaluation relied on a post-training questionnaire and facilitator observation. Participant responses were consistently positive: 61.9% strongly agreed that the packaging materials were easy to understand, 71.4% strongly agreed that they understood the importance of packaging, 57.1% strongly agreed that they could design product labels using Canva, 42.9% strongly agreed that they understood basic business-feasibility calculations, and 52.4% strongly agreed that they intended to apply the acquired skills. The financial simulation further showed that the reported production cost was below the proposed selling-price range. Overall, the program was well accepted and practically relevant. However, because no pretest or comparison group was used, causal conclusions regarding effectiveness or knowledge improvement cannot be drawn.

Keywords: biomass briquettes; business feasibility; community empowerment; packaging innovation; rural women

Abstrak

Masyarakat perdesaan dapat menghadapi kendala dalam meningkatkan nilai pasar produk lokal apabila pengetahuan mengenai kemasan dan pengelolaan usaha masih terbatas. Briket biomassa tempurung kelapa memiliki potensi sebagai produk energi terbarukan sekaligus sebagai bentuk pemanfaatan residu biomassa lokal. Kegiatan pengabdian kepada masyarakat ini bertujuan memperkuat kapasitas kelompok perempuan melalui pelatihan inovasi kemasan dan analisis kelayakan usaha dasar untuk briket biomassa tempurung kelapa. Kegiatan dilaksanakan di Desa Karangcangkring, Kecamatan Dukun, Kabupaten Gresik, Jawa Timur, pada 23 Mei 2026 dan melibatkan 22 anggota kelompok perempuan. Pendekatan partisipatif memadukan ceramah interaktif, demonstrasi, praktik desain kemasan menggunakan Canva, diskusi kelompok, serta latihan perhitungan harga pokok produksi, penetapan harga, estimasi keuntungan, dan periode pengembalian investasi. Evaluasi program menggunakan kuesioner pascapelatihan dan observasi fasilitator. Respons yang dilaporkan secara konsisten positif: 61,9% peserta sangat setuju bahwa materi kemasan mudah dipahami, 71,4% sangat setuju

memahami pentingnya kemasan, 57,1% sangat setuju memahami desain label menggunakan Canva, 42,9% sangat setuju memahami perhitungan dasar kelayakan usaha, dan 52,4% sangat setuju berniat menerapkan keterampilan tersebut. Simulasi keuangan juga menunjukkan biaya produksi yang dilaporkan berada di bawah rentang harga jual yang diusulkan. Program dinilai dapat diterima dan relevan secara praktis, tetapi tidak adanya data pretest dan kelompok pembandingan membatasi kesimpulan mengenai efektivitas atau peningkatan pengetahuan.

Kata kunci: briket biomassa; kelayakan usaha; pemberdayaan masyarakat; inovasi kemasan; perempuan perdesaan

INTRODUCTION

The global transition toward renewable energy has increased interest in agricultural biomass as both an alternative fuel and a resource for local value creation. Biomass residues can be converted into useful products that reduce waste while supporting household-scale economic activity. Coconut shells are particularly relevant because their carbon content and fuel characteristics make them suitable for briquette production (Hadiyanto et al., 2023; Yirijor & Bere, 2024; Fardin & Nurjannah, 2024). In rural settings, the value of coconut-shell briquettes extends beyond energy substitution: when technical production is supported by appropriate post-production and business-management capabilities, briquettes can also provide an entry point for microenterprise development.

Product competitiveness, however, depends on more than the ability to manufacture briquettes. Packaging influences product identification, perceived quality, brand recognition, and purchasing decisions, while basic financial management enables producers to determine production costs, set appropriate selling prices, estimate profit margins, and assess the financial feasibility of household-scale enterprises. Studies of micro and small enterprises have shown that packaging innovation and marketing capability can enhance product attractiveness and business performance (Maziriri, 2020; Badri et al., 2022; Pranowo et al., 2024). Financial analysis is equally important for biomass enterprises because production costs and pricing structures determine whether a technically feasible product can be sustained commercially (Bot et al., 2023; Girmay et al., 2025).

The partner community in Karangcangkring Village, Dukun District, Gresik Regency, consisted of women involved in Family Welfare Empowerment activities and local micro-scale enterprises. A preliminary needs assessment conducted through observation and discussion identified an estimated 1.3-1.5 m³ of coconut-shell waste generated daily in the local area, much of which was either used as conventional fuel or discarded. The assessment also identified two major barriers to commercialization: limited skills in packaging, labeling, branding, and digital design, and limited capacity to calculate production costs, selling prices, profit, break-even points, and investment-recovery indicators. These gaps constrained the community's ability to transform an available biomass resource into a differentiated product supported by basic business planning.

Previous community empowerment initiatives involving biomass briquettes have often focused primarily on production techniques, while post-production competencies have received less attention. Yet packaging, branding, financial literacy, and market preparation

become critical when communities move from demonstration-scale production toward microenterprise development. The practical gap addressed by this program was therefore not briquette production itself, but the participants' capacity to present the product professionally and make basic business decisions using accessible financial calculations. By integrating packaging innovation through Canva with simple business-feasibility exercises, the program offered a locally adapted capacity-building model that connected renewable-biomass utilization with women's entrepreneurship and rural economic empowerment.

Accordingly, the program aimed to strengthen participants' practical understanding of packaging development, product branding, digital label design, and basic business-feasibility analysis for coconut-shell biomass briquettes. The immediate outcomes were participants' post-training perceptions of material clarity, self-reported understanding of packaging and financial-analysis concepts, and intention to apply the acquired skills. Because the activity did not include a pretest or control group, the evaluation was designed as a descriptive post-training assessment rather than a test of causal effectiveness.

METHODS

This community engagement program employed a participatory capacity-building approach with a single-group post-training evaluation. The activity did not include a baseline pretest or a control/comparison group. Accordingly, the program was evaluated descriptively using post-training participant responses, facilitator observations, and outputs produced during the training sessions. Claims of effectiveness or measured improvement were avoided because no pre-intervention comparison was available.

The program was implemented on 23 May 2026 in Karangcangkring Village, Dukun District, Gresik Regency, East Java, Indonesia.

The partner was a rural women's community group involved in village empowerment activities. Twenty-two participants, aged approximately 26-56 years, attended the program and were predominantly housewives and micro-scale entrepreneurs. The group was selected because of its active role in household welfare, local entrepreneurship, and community empowerment.

The program consisted of preparation, implementation, and evaluation stages. Preparation included field observation, discussions with community representatives, identification of priority needs, and development of learning materials. The packaging session covered packaging functions, labeling, branding, and digital design using Canva. The business session addressed production-cost calculation, cost of goods manufactured, selling-price determination, profit estimation, and investment payback using a household-scale briquette scenario. Demonstrations, hands-on exercises, and group discussions were incorporated to encourage active participation.

The primary indicators were post-training responses concerning material clarity, perceived understanding of the value of packaging, ability to use Canva for label design, understanding of basic cost and payback calculations, and intention to apply the acquired knowledge. Secondary outputs included completion of practical packaging-design exercises and

participation in the business-feasibility simulation. No a priori numerical threshold for program success was specified in the available program documentation.

Evaluation data were obtained from a post-training questionnaire, facilitator observations, attendance records, and activity outputs. The questionnaire used agreement categories to assess participants' perceptions and self-reported understanding. The available documentation did not specify the total number of response-scale points beyond the categories presented, the instrument-development process, evidence of validity, reliability coefficients, or detailed scoring procedures.

Questionnaire responses were summarized descriptively using the reported percentages. No pretest-posttest comparison, inferential statistical test, effect-size estimate, confidence interval, or statistical software was reported. Twenty-two participants attended the activity; however, the denominator used to calculate the questionnaire percentages was not explicitly documented and was therefore not inferred.

The available program documentation did not report formal ethics-committee approval, written informed consent, privacy procedures, or consent for image use. These details should be verified by the authors and reported where applicable before publication. Sustainability was addressed through recommendations for continued mentoring, application of packaging and financial-analysis skills to community products, and future collaboration with local government, cooperatives, and institutions supporting microenterprises. Longer-term monitoring of product commercialization, sales, and continued use of the introduced tools was not reported.

The training introduced a simple cost of goods manufactured (COGM) calculation: $\text{COGM} = \text{Total Production Cost} / \text{Total Production Output}$. Total production cost comprised raw materials, binder, labor, and operating expenses, whereas total production output was expressed in kilograms.

A simple investment-payback calculation was also introduced: $\text{Payback Period} = \text{Total Investment} / \text{Net Profit per Day}$. These calculations were presented as educational tools for household-scale business planning rather than as audited financial projections.

RESULTS

The program involved 22 members of the rural women's community group. Participants were women aged approximately 26–56 years who were primarily housewives and micro-scale entrepreneurs involved in village empowerment activities. The program focused on two complementary areas of capacity building: packaging and product presentation, and basic business-feasibility analysis.

Table 1. Partner and participant characteristics

Characteristic	Category / summary	n	%
Participant group	Rural women's community group	22	100
Age range	Approximately 26–56 years	22	100
Main roles	Housewives and micro-scale entrepreneurs	22	100

During the packaging session, participants practiced identifying essential packaging elements, including the product name, label information, net weight, usage information,

producer identity, and branding components. Canva was introduced as an accessible digital platform for practical label and packaging design. The business-feasibility session introduced production-cost calculation, cost of goods manufactured, selling-price determination, profit estimation, and investment-payback concepts using a household-scale biomass-briquette scenario.

Table 2. Financial simulation used in the household-scale briquette training

Parameter	Reported value
Coconut-shell feedstock	50 kg/day
Biomass briquette output	27 kg/day
Reported COGM	IDR 9,250/kg
Proposed selling price	IDR 12,000–15,000/kg
Estimated daily revenue	IDR 324,000–405,000
Reported investment payback period	Approximately 17 days

The reported COGM was lower than the proposed selling-price range, indicating a positive margin within the training scenario. The simulation illustrated how production costs and selling prices can be compared in basic business planning. However, because the program documentation did not provide a complete audited cost structure or the exact daily net-profit figure, the simulation should be interpreted as an educational example rather than as a verified estimate of profitability.

Post-training participant evaluation

Table 3. Reported post-training participant responses

Evaluation statement	Disagree (%)	Agree (%)	Strongly agree (%)
Packaging materials were easy to understand	0.0	38.1	61.9
Understood the importance of packaging in increasing product value	0.0	28.6	71.4
Understood how to design product labels using Canva	0.0	42.9	57.1
Understood COGM and investment payback calculation	0.0	57.1	42.9
Intended to apply packaging and feasibility analysis in community products	0.0	47.6	52.4

All reported responses fell within the positive agreement categories. The highest proportion of 'strongly agree' responses was recorded for understanding the importance of packaging in increasing product value (71.4%). Strong agreement was also reported for the clarity of the packaging materials (61.9%), the ability to design product labels using Canva (57.1%), intention to apply the acquired skills (52.4%), and understanding of basic cost and payback calculations (42.9%). These findings indicate high acceptability and positive self-reported understanding immediately after the program. However, they do not demonstrate measured improvement because no baseline assessment was conducted.

DISCUSSION

The program addressed a practical commercialization gap in community-based biomass development. Rather than focusing solely on the production of coconut-shell briquettes as a renewable-energy product, the training introduced post-production competencies needed to support market-oriented use. Packaging, labeling, branding, and financial planning are important at this stage because technical production alone does not ensure product differentiation, disciplined pricing, or market readiness. The consistently positive post-training responses suggest that the selected training topics were relevant to the partner community's immediate needs.

Packaging innovation was a central component of the program because community products often compete in markets where presentation and product information shape consumer perceptions. The high proportion of participants who strongly agreed that they understood the importance of packaging supports the practical relevance of this component. Previous studies have likewise associated packaging innovation with product attractiveness, differentiation, and sales performance among microenterprises (Maziriri, 2020; Badri et al., 2022; Pranowo et al., 2024). The use of Canva may also have lowered the technical barrier to design practice by providing an accessible tool that participants could continue to use without specialized graphic-design software.

The business-feasibility component complemented the packaging session by strengthening awareness of production costs and pricing. Community enterprises may underestimate actual production costs when pricing decisions are based primarily on competitors' prices or informal estimates. Introducing COGM and investment-payback concepts provided participants with a structured framework for considering raw materials, labor, operating expenses, selling prices, and investment recovery. Economic studies of biomass briquettes similarly emphasize that financial viability depends on production efficiency and the relationship between production cost and market price (Bot et al., 2023; Girmay et al., 2025). In the present training scenario, the reported COGM was below the proposed selling-price range, making the simulation useful for illustrating positive-margin business planning. Nevertheless, the figures should not be interpreted as a validated enterprise forecast because a complete audited cost structure and sensitivity analysis were not available.

The integration of packaging and business analysis represents a key strength of the program. Packaging can enhance product visibility and perceived value, whereas cost and pricing analysis supports more informed managerial decision-making. Addressing both areas within a single program reflects the practical sequence faced by rural microenterprises: products need to be presented credibly while also being priced on the basis of production costs and expected returns. This integrated approach is consistent with community-empowerment literature that emphasizes practical, participatory, and entrepreneurship-oriented capacity building rather than one-way knowledge transfer (Pugu et al., 2024).

Although the post-training responses indicate strong acceptability, the evaluation design substantially limits interpretation. The program did not include a pretest, a control group, or

an objective assessment of participant competency. Consequently, the available evidence does not support claims of improved understanding or training effectiveness in a causal sense. A more appropriate interpretation is that participants reported finding the material understandable, perceived that they understood the key concepts after the session, and expressed an intention to apply the skills. Self-reported understanding may overestimate actual competency, particularly for financial calculations and digital-design tasks. Future evaluations should therefore include baseline measurement and direct assessment of completed packaging designs and cost calculations.

A further methodological issue concerns the denominator used for the questionnaire percentages. Although 22 participants attended the program, the reported percentages are not readily reconcilable with a denominator of 22, and the number of valid questionnaire responses was not explicitly documented. This information should be verified before publication. Clear reporting of valid responses is necessary to ensure that percentages can be interpreted accurately and, where appropriate, converted into participant counts.

Sustainability also requires evidence beyond immediate post-training responses. Participants expressed an intention to apply the acquired skills, but no follow-up data were reported regarding adoption of packaging prototypes, commercialization of the briquettes, expansion of online or offline marketing, or continued use of the financial-planning tools in subsequent production cycles. For a community-empowerment program, these downstream indicators are important because sustainability depends on continued practice, partner ownership, market access, and institutional support. Continued mentoring could therefore focus on product standardization, packaging refinement, digital marketing, simple bookkeeping, and market testing.

Overall, the program was well aligned with community-development objectives because it connected local biomass utilization, women's capacity building, renewable-energy awareness, and microenterprise skills. Its principal contribution lies in integrating post-production packaging with basic business planning within a single rural empowerment activity. Future implementation should move beyond immediate participant perceptions toward measurable competency and enterprise outcomes by incorporating pretest-posttest assessment, a comparison group where feasible, objective performance rubrics, and follow-up indicators such as adoption, continuity of production, sales, and market reach.

CONCLUSION

The community engagement program provided 22 rural women in Karangcangkring Village with practical training in packaging innovation and basic business-feasibility analysis for coconut-shell biomass briquettes. Post-training responses indicated high acceptability, with strong agreement regarding the importance of packaging, clarity of the training materials, use of Canva, understanding of basic financial calculations, and intention to apply the acquired skills. The financial simulation also demonstrated how reported production costs could be compared with a proposed selling-price range for household-scale business planning. However, because the program did not include a pretest, a control group, or an objective

competency assessment, the findings support conclusions regarding participant acceptability and self-reported understanding rather than causal effectiveness or measured improvement. The program may therefore be considered an initial capacity-building model that links local biomass utilization with rural women's entrepreneurship.

RECOMMENDATIONS

Village partners and the university team should continue mentoring activities focused on packaging refinement, digital marketing, simple bookkeeping, and market testing. Future evaluations should include baseline and post-training assessments, objective competency rubrics, verification of valid questionnaire-response counts, and follow-up measurement of product adoption, sales, and continued use of business-planning tools.

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