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Assistance in Plastic Waste-Based Paving Block Production for the Economic Empowerment of the Layana Indah Community

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Abstract

Purpose: The program was designed to equip residents of Layana Indah, Palu, Indonesia, with practical knowledge of plastic waste utilization through paving block production. In addition to the technical aspects, the activities introduced basic business management and marketing strategies to encourage the development of community-based economic opportunities.

Method: The program involved community participation through coordination, socialization, and practical guidance on sorting plastic waste and producing paving blocks. Participants also received basic training in business management and marketing. Evaluation focused on their understanding of production processes, costs, and marketing.

Practical Applications: The program used polypropylene (PP) and high-density polyethylene (HDPE) waste as materials for paving block production. Cement and sodium silicate were also included in the mixture. Participants learned to record production costs, set selling prices, organize group responsibilities, develop product identity, and promote products through digital media.

Conclusion: The report records the socialization activities, technical assistance, and production of a video documenting the program. However, no pre- and post-training assessment data, product test results, or business revenue figures were available. Further guidance and product testing are needed to assess product quality and potential economic benefits.

Introduction

Plastic waste management remains a concern in many communities, including Layana Indah, Palu, Indonesia. The progress report identifies several challenges, such as inadequate waste sorting, limited skills in plastic waste processing, and a lack of experience in production management and marketing. Converting plastic waste into useful products offers a potential solution. However, successful implementation requires proper production techniques, workplace safety, quality control, and effective business planning (Simarmata et al., 2026)

Previous studies have examined the use of recycled plastic in paving block production (Agyeman et al., 2019). evaluated plastic-based paving blocks using compressive strength and water absorption tests (Ngayakamo, 2025). Also highlighted the influence of material composition on the physical and mechanical properties of these products. These studies emphasize the need for technical testing to determine product performance. Their findings cannot be directly applied to the paving blocks produced in the present program because the material composition and production methods may differ.

Community-based recycling programs can also create economic opportunities when technical training is supported by entrepreneurship development, community participation, and marketing activities (Pradana et al., 2024). Discussed approaches that link plastic waste management with community economic empowerment. Digital marketing may help small businesses reach potential customers. Nevertheless, product quality, production costs, consumer confidence, and supply consistency remain important factors in developing a sustainable business (Febriyantoro & Arisandi, 2018)

In response to these challenges, the program in Layana Indah introduced the production of paving blocks using plastic waste and provided basic guidance on business management and marketing. This article describes the implementation of the activities and the outputs documented in the progress report. However, the available report does not include participant numbers, pre- and post-training assessment scores, laboratory test results, or sales data. Therefore, the discussion focuses on the activities conducted and the knowledge introduced, without making unsupported claims about improvements in product performance or community income.

Method

The community engagement program was conducted in Layana Indah, Palu, Central Sulawesi, Indonesia, under the 2026 Research Dissemination Community Service Scheme funded by the Faculty of Engineering, Universitas Tadulako. The program targeted local community members, particularly those affiliated with the Family Welfare Movement (PKK), youth organizations (Karang Taruna), and other residents of working age. A participatory, practice-oriented approach was adopted to facilitate coordination among the implementation team, community members, and local stakeholders.

The program was implemented through four main stages. The first stage involved preparation, including identifying community needs, assessing local potential, coordinating with relevant stakeholders, and preparing materials on plastic waste utilization, production techniques, entrepreneurship, and marketing. The second stage focused on socialization and technical assistance. Participants were introduced to plastic identification and sorting, feedstock preparation and shredding, the preparation of cement and sodium silicate, material mixing, molding, and product finishing. The plastic types addressed in the program were polypropylene (PP) and high-density polyethylene (HDPE), as documented in the progress report.

The third stage addressed basic business management and marketing. The topics included establishing a community business group, assigning responsibilities, preparing a simple business plan, recording production costs, determining selling prices, identifying target markets, developing product identity, and promoting products through digital media. Cost components discussed included raw materials, plastic collection and sorting, labor, energy,

equipment use, packaging, and distribution, where applicable.

The fourth stage involved monitoring and evaluation. These activities were intended to review participants' understanding of the production process, quality control, production costs, and marketing concepts. Participation and discussion during the activities were also considered in the evaluation process.

This article presents a descriptive account of the program based on the activities and outputs documented in the progress report. However, the available documentation does not include a complete attendance dataset, structured pre- and post-training assessment results, laboratory test data, or records of sales and profits. Therefore, the analysis does not include statistical testing or quantitative claims regarding changes in participants' knowledge, household income, or product performance. The technical suitability of the resulting paving blocks remains to be established through further laboratory testing.

Result

Preparation and coordination, the initial stage involved identifying the potential use of plastic waste as a community-based productive activity. The implementation team coordinated with local stakeholders to align the program with community needs and available resources. The activity was designed to combine technical training in paving block production with basic business management and marketing. This integrated approach was intended to introduce participants to both the production process and the organizational aspects of developing a community-based enterprise.

Photo 1. Socialization And Introductory Discussion With Community Participants



Source: Author's Work, 2026.

Technical socialization and production assistance,the technical sessions introduced participants to the main stages of paving block production, including plastic waste sorting, material preparation, mixing, molding, and product finishing. Video materials were also used as visual learning aids to support the explanation of production procedures. Particular attention was given to the consistency of the mixture, molding procedures, product dimensions, and surface quality. Strength and durability were also identified as important performance criteria for paving blocks. However, the progress report does not provide laboratory test results for the products produced during the program. Consequently, these products should be regarded as preliminary outputs of the training activity rather than construction products with verified technical performance.

Photo 2. Demonstration And Explanation Of Paving-Block Production Steps.



Source: Author's Work, 2026

Business management and marketing, the program also introduced basic principles of community-based business management. The topics covered included the distribution of responsibilities within a business group, simple business planning, production-cost recording, and selling-price calculation. Participants were also introduced to target-market identification, product branding, product presentation, and digital promotion. These topics were intended to connect plastic waste processing with the practical requirements of developing a small-scale enterprise. The program recognized that the availability of plastic waste alone is insufficient to establish a sustainable business. Consistent material collection, organized production, financial management, and effective marketing are also necessary considerations.

Photo 3. Community-Facing Activity Related To Preparation And Handling Of Plastic Waste.



Source: Author's Work, 2026

Monitoring, participation, and program outputs, onitoring and evaluation were intended to review participants' understanding of production procedures, business management, and marketing. According to the progress report, the documented outputs included socialization activities, technical assistance, an introduction to the stages of paving block production, and a video documenting the program. Nevertheless, the available documentation does not provide a complete record of participant numbers, quantitative measurements of learning outcomes, or data on business performance. Therefore, the effectiveness of the program in improving participants' knowledge or generating economic benefits cannot yet be quantified. Further evaluation using participant assessments, product testing, and business records would provide a stronger basis for assessing the program's outcomes.

Figure 4. Documentation of Community Engagement Activities in Layana Indah



Source: Author's Work, 2026

Discussion

The program approached plastic waste utilization as both a technical learning activity and a potential pathway for community enterprise development. The production demonstration introduced participants to the possibility of converting plastic waste into value-added products. Meanwhile, the business management and marketing sessions addressed several practical requirements for organizing such an initiative. These included task allocation, production-cost calculation, product promotion, and market identification. This integrated approach is consistent with community empowerment initiatives that combine recycling activities with entrepreneurship, collective participation, and market access (Slat et al., 2026; Wordailmi et al., 2025).

An important consideration is the distinction between demonstrating a production process and establishing the technical suitability of the resulting product. Previous studies on plastic-based paving blocks indicate that material type, binder or filler composition, mixture proportions, and processing methods may affect compressive strength, water absorption, and other performance characteristics (Agyeman et al., 2019; Ngayakamo, 2025; Sidin et al., 2026). The Layana Indah program used a mixture described in the progress report as comprising plastic waste, cement, and sodium silicate. Therefore, findings from studies employing plastic–sand mixtures or other formulations cannot automatically be applied to the products developed in this program. Further investigation should document material proportions, processing conditions, specimen dimensions, and curing or conditioning procedures, where applicable. Laboratory testing is also necessary to determine whether the products meet the requirements for their intended use.

Occupational safety and environmental management are additional considerations for future program development. Plastic processing, particularly when heating is required, should follow appropriate safety procedures. These may include adequate ventilation, suitable personal protective equipment, controlled operating conditions, and safe material handling. Plastic feedstock should also be sorted and cleaned as necessary, while uncontrolled burning and the release of potentially harmful fumes should be avoided. Accordingly, the circular-economy potential of this initiative should be assessed not only in terms of the resulting product but also in relation to material sourcing, production safety, process-related waste, and the suitability of the final product for its intended application (Navulani et al., 2026).

From a business perspective, production costs and selling prices should be determined using documented expenditures. Relevant cost components include plastic collection and sorting, raw materials, labor, energy, equipment use or depreciation, packaging, and distribution. Recording these expenses would allow the community group to estimate unit production costs and compare proposed selling prices with customer expectations and competing products. Digital marketing may help increase product visibility, but promotional statements should accurately reflect the available evidence. Claims concerning strength, durability, or environmental benefits should not be made as established facts unless supported

by appropriate testing or assessment (Febriyantoro & Arisandi, 2018; Slat et al., 2026).

The main limitation of the available progress report is the lack of quantitative evaluation data and validated product test results. The documentation confirms that socialization and initial technical assistance were conducted. However, it does not establish measurable changes in participants' knowledge, household income, or market demand. Subsequent activities should therefore include systematic attendance records, brief pre- and post-training assessments, production logs, cost records, and laboratory testing based on standards relevant to the intended application. These measures would provide a more reliable basis for evaluating the program's outcomes and determining the feasibility of sustaining or replicating the initiative in other communities.

Conclusion

The community engagement program in Layana Indah, Palu, introduced the use of plastic waste in paving block production, complemented by basic training in business management and marketing. The activities covered plastic sorting and preparation, mixing and molding demonstrations, production-cost calculation, selling-price determination, product branding, and digital promotion. The progress report documents the implementation of socialization and technical assistance, as well as a video documenting the activities.

However, the available documentation does not include quantitative data on learning outcomes, laboratory test results, or realized economic benefits. Therefore, the program's effectiveness in improving participants' knowledge, establishing product quality, or generating sustainable income cannot yet be determined. Further assistance should focus on technical testing against relevant standards, safe production practices, organized business management, systematic cost recording, and evidence-based marketing. These measures are needed to assess the technical suitability of the paving blocks and the potential for sustained economic benefits within the community.

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