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Community Empowerment Through Biomass Wass Management: A Case Study of Kang Ebit Programme

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Abstract

The increasing volume of seasonal biomass waste such as siwalan (lontar palm) peels and coconut shells in Kapu Village, Merakurak Sub-district, Tuban Regency, has led to significant environmental and social challenges. This waste is often underutilized and typically burned in the open, causing air pollution and contributing to carbon emissions estimated at ±6–8 tons of CO_2 per year. Meanwhile, the majority of the village's working-age population depends on seasonal agriculture, with limited alternative economic opportunities especially for vulnerable groups such as the elderly, housewives, persons with disabilities, and the unemployed. This community engagement program introduced briquette production from siwalan peels and coconut shells through a participatory approach, simple technology transfer, and entrepreneurship mentoring. The initiative resulted in increased community skills in briquette production and the emergence of local entrepreneurial efforts. Furthermore, it helped reduce open burning practices and created new income sources for vulnerable groups. The program demonstrates that biomass waste utilization can not only benefit the environment but also promote inclusive economic empowerment in rural communities.

Keywords Biomass Waste, Briquettes, Carbon Emissions, Palm Sugar.

INTRODUCTION

The problem of biomass waste in rural areas remains a serious challenge to sustainable environmental management. In Kapu Village, Merakurak District, Tuban Regency, the abundant palm bark and coconut shell waste that occurs each harvest season is not optimally utilized. Most of this waste is simply piled up or burned openly, causing air pollution and contributing to increased carbon emissions. According to Putri et al. (2021), open burning of biomass waste is one of the largest contributors to carbon emissions in rural areas and directly impacts air quality and the health of surrounding communities.

In addition to environmental issues, Kapu Village also faces economic challenges. The community's economic structure relies heavily on seasonal agriculture, with limited alternative economic opportunities, especially outside the planting season. This situation is exacerbated by the low level of involvement of vulnerable groups such as housewives, the elderly, people with disabilities, and the unemployed in productive economic activities. This aligns with the findings of Nuraini and Sugiharto (2020), which show that the economic empowerment of vulnerable groups in agrarian villages can be significantly increased through the development of locally-based entrepreneurship.

Several previous community service programs have demonstrated the effectiveness of waste utilization approaches as alternative energy sources. For example, activities conducted by Lestari et al. (2022) in Banyuwangi Regency successfully empowered the community through training in briquette production from agricultural waste, which not only reduced environmental pollution but also created a new source of income for local residents. Similar findings were also demonstrated by Rahmawati (2023), who reported a 25% increase in household income after training in briquette production from coconut shell waste.

Based on this background, this community service activity aims to: (1) reduce environmental pollution due to the burning of biomass waste by processing waste into environmentally friendly briquettes; and (2) increase the economic capacity of the community, especially vulnerable groups, through briquette production training and entrepreneurship mentoring based on local potential. It is hoped that this community service activity will result in increased community skills in briquette production and the emergence of local entrepreneurial ventures and help reduce open burning practices and create new sources of income for vulnerable groups.

METHODS

This community service activity implemented a Participatory Action Research (PAR) approach, in which researchers act as catalysts for change and active learning partners with the community. This method was chosen because the company considers people as active subjects, not just as objects. So that the community is fully involved in the development process. This method is used to explore existing issues while encouraging tangible and measurable improvements in social conditions. The information presented in this paper was obtained through data collection methods with a qualitative approach. The use of this qualitative approach makes it possible to conduct an in-depth study of the relationship between the process and results of social activities. A qualitative approach was chosen in this research to obtain in-depth and accurate data that is adapted to conditions in the field (Neuman, 2014). The qualitative approach seeks to produce deep meaning in the facts of phenomena in the field (Rubin & Babbie, 2011). This approach is implemented through a collaborative, participatory, and sustainable process, with an orientation toward social transformation at the community level (Afandi, 2020). Data collection was conducted through field observations and in-depth interviews with members of the Kang Ebit Joint Business

Group and stakeholders involved in program management. Data analysis was qualitative to more comprehensively understand the dynamics that occurred, including the challenges, potential, and social impacts of the interventions carried out (Saleh, 2017).

FINDINGS AND DISCUSSION

Sustainable community development must integrate two key approaches: social justice and ecological justice. Environmental conservation efforts are meaningless without social justice, and conversely, social justice is meaningless in a damaged ecological environment (Ife, 2016). The Kang Ebit program, implemented since 2023, involves the active participation of various community groups, including nine productive-age youth, four housewives, and two seniors. This program aims to optimize the utilization of organic waste from the surrounding environment, such as palm bark and coconut shells. Through a collaborative business group empowerment approach, this waste is processed into briquettes that have both economic value and are environmentally friendly.

Future-fit societies safeguarding the possibility that humans and other life will thrive on Earth forever by being socially just, economically inclusive, and environmentally regenerative. This is an extension of the future-fit business framework, which places the focus of business on societal progress toward the future (Elkington, 2020). The initiation of the Kang Ebit KUB was an effort to address local issues, namely the community's reliance on agriculture as their primary occupation and environmental pollution.

Figure 1. Briquette Production Process

Figure 2. Briquette Packing Process

The establishment of the Kang Ebit Joint Business Group (Kelompok Usaha Bersama-KUB) has contributed to the realization of a circular economy in Kapu Village, Merakurak District. Briquettes produced by KUB Kang Ebit are marketed at a price of IDR 5,000 per kilogram in various variants and specifications. PT Pertamina Patra Niaga Fuel Terminal Tuban provides intensive assistance, including infrastructure facilitation, procurement of operational support facilities and infrastructure, basic occupational safety and health (K3) training, research facilitation, patent certificate processing, and marketing support.

Figure 3. Training of Basic Occupational Safety and Health (Keselamatan dan Kesehatan Kerja-K3)

Currently, Kang Ebit briquette products have reached markets in various regions of Indonesia such as East Java, Bekasi, Jakarta, Yogyakarta, Bali, NTT, and Timika, and have been exported to India and Timor Leste.

The Kang Ebit program is implemented through cross-sector collaboration involving various stakeholders. The Kapu Village Government acts as a supervisor by issuing a Kang

Ebit Group Decree, while the Tuban Regency Cooperatives, Industry, and Trade Office assists in improving product quality. The Regional Development Planning Agency (Badan Perencanaan Pembangunan Daerah-BAPPEDA) and the Environmental Agency provide support for the development of environmentally friendly products and the diversification of their derivatives.

Other contributions were also by Diponegoro University. They are contributes through research and innovation in sustainability-oriented production technologies, and digital communities from various sectors are involved as potential partners in the marketing strategy. In its implementation, this program applies an inclusive communication pattern through an annual planning forum, regular offline and online monitoring, and program evaluation that involves all stakeholders in a participatory manner.

The formation of KUB Kang Ebit is able to answer the community's needs for 3 (three) things, namely an inefficient system, an unfair system, and a system that is unable to optimize potential with the following details:

Table 1. Fulfilling community needs through the Kang Ebit Program

No.	Aspects of Change	Conditions Before the Program	Condition After Program
1.	Inefficient system	1. There is no system; waste is dumped, buried, or burned. 2. Residents' economic activities are limited to the seasonal agricultural sector.	1. Waste is collected, sorted and processed into briquettes in a structured manner with a production capacity of 700 kg - 14 tons per month. 2. Additional business activities are available through the production and sale of briquettes.
2.	Unfair system	Domestic roles (women and the elderly) are not considered to be an economic contribution	The role of women and vulnerable groups is beginning to be recognized as part of strengthening the village economy, with incomes of up to Rp. 1,700,000 per month.
3.	A system that is unable to optimize potential	Coconut shell and palm bark waste is thrown away or burned, it has no economic value	Waste is processed into briquettes, a valuable and environmentally friendly product with prices starting from IDR 5,000 per kg.

Source: Primary Data, processed, 2025

The Kang Ebit program transforms an inefficient waste management system characterized by environmental pollution from the disposal of palm sugar palm waste and coconut shell charcoal into a productive and sustainable economic activity. Through

processing innovation, this waste is now processed into environmentally friendly briquettes with economic value, with selling prices starting from IDR 5,000 per kilogram and a production capacity of 700 kg to 14 tons per month. In addition to improving the efficiency of local resource management, this program also contributes to the creation of social justice by opening economic access for women and vulnerable communities. The previously under-recognized domestic role as an economic contributor is now recognized, where they are directly involved in productive village activities and are able to earn an income of up to IDR 1,700,000 per month.

The success of the Kang Ebit Program can also be viewed through the Community Empowerment Theory and the Capability Approach, which emphasize the importance of building community capacity to enable them to access, choose, and utilize opportunities to achieve a life they deem meaningful. According to Nussbaum and Sen (2010), the capability approach emphasizes the substantive freedom of individuals to live a life of value, not solely based on income, but on the ability to do and be something. In this context, the establishment of the Kang Ebit Community Business Unit (KUB) provides a space for the Kapu Village community to expand their capabilities, ranging from technical skills in waste processing, increasing entrepreneurial knowledge, to the confidence to contribute to village development. The empowerment process is also in line with Laverack's (2006) view that community empowerment is not only about the end result, but also about a participatory process that allows communities to control the factors that influence their lives. Thus, the Kang Ebit Program not only impacts the economic and environmental aspects, but also sparks social transformation through strengthening the capacity and active participation of the community as a whole.

CONCLUSION

The Kang Ebit program in Kapu Village demonstrates that community-based biomass waste management can be an effective approach to simultaneously achieving ecological and social justice. Through the formation of a Joint Business Group (KUB), organic waste such as palm bark and coconut shells has been successfully processed into environmentally friendly, economically valuable briquettes, with a production capacity of up to 14 tons per month and a selling price starting at IDR 5,000 per kilogram. This program has also succeeded in opening access to participation for women, youth, and the elderly in village economic activities, who were previously marginalized from recognition of their economic contributions. The empowerment approach implemented not only increases individual and collective capacity but also strengthens the village's social and ecological structure. With multi-stakeholder support, from the village government, regional agencies, universities, and digital communities, this program is a good practice in implementing community empowerment theory and a capability approach that positions development as a process of expanding valuable life choices for the community.

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