

Utilization of Organic Waste Coconut Shells as an Alternative Energy Source in the Laogo Area

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Abstract.

Indonesia has abundant biomass resources, one of which comes from coconut shell waste that has not been optimally utilized. Coconut shell waste has the potential to be processed into briquettes, an environmentally friendly alternative energy source with economic value. This Community Service (PKM) activity aims to improve the knowledge and skills of communities in the Laogo region in utilizing coconut shell waste into briquettes and increase their understanding of renewable energy-based business management. The activity implementation methods included outreach, briquette-making demonstrations, an initial questionnaire to determine the community's level of knowledge, and Focus Group Discussions (FGDs) to identify obstacles and find solutions appropriate to local conditions. The results of the activity showed an increase in community understanding of the briquette-making process and its use as an alternative fuel. In addition, the community also gained knowledge about managing small businesses based on waste processing. The community response to this activity was very positive, with most participants expressing interest in producing briquettes independently. Obstacles faced included limited equipment, business capital, and technical knowledge. Therefore, ongoing support from various parties is needed to improve the sustainability of businesses based on the utilization of coconut shell waste and to support the development of renewable energy at the community level.

Keywords: Renewable Energy; Briquettes; Waste and waste utilization.

I. INTRODUCTION

Indonesia is a tropical country that has sufficient natural resource potential, such as coconut plants, which are widespread in Indonesia and are an important commodity for the community. Coconut plantations in Indonesia cover millions of hectares and are mostly managed by the community. However, the use of coconut derivative products is still not optimal, especially in the coconut shell section, which often becomes waste after the coconut meat and water are used.[1] As the population grows, energy needs also increase, necessitating alternative energy sources. Among the renewable energy sources that merit special attention in their development is biomass.[2] Coconut shell waste that is not managed properly can cause environmental problems, and also shows that the utilization of available biomass resources is not optimal.[3] By utilizing the potential of local waste, the community not only obtains a more economical alternative energy source but also contributes to sustainable environmental management and improving economic welfare based on local resources.[4] Coconut shells have enormous potential as a raw material for alternative energy production in the form of charcoal and briquettes. Coconut shell briquettes are a solid fuel produced through a process of carbonization and molding of charcoal powder using a specific adhesive.

This product has a relatively high calorific value, stable combustion, and relatively lower emissions compared to conventional fossil fuels.[5] Coconut shell briquettes also have quite large market opportunities both domestically and for export, especially as fuel for household activities, barbecues, and shisha.[6] The development of briquettes from coconut shell biomass also aligns with national energy policies that encourage increased use of new and renewable energy. Limited fossil fuel reserves and increasing energy demand are driving various countries, including Indonesia, to develop more sustainable and environmentally friendly alternative energy sources.[7],[8] The use of biomass as a renewable energy source can reduce dependence on fossil fuels while providing added value to agricultural and plantation waste.[9] On the other hand, the utilization of coconut shell waste also has the potential to improve community welfare through the development of biomass-based energy businesses. Processing coconut shell waste into briquettes can create a

new, economically valuable business opportunity and support more sustainable waste management. Several studies have shown that producing biomass briquettes from agricultural waste can improve household energy efficiency and open up opportunities for small- and medium-scale businesses at the community level.[10].

However, in practice, various obstacles remain in utilizing coconut shell waste at the community level. These obstacles include limited knowledge of briquette processing technology, limited production equipment, and a lack of understanding of business management and product marketing. This situation is also found in communities in the Laogo region, which has significant coconut shell waste potential but has not yet been optimally utilized as an alternative energy source or economically valuable product. Based on these conditions, community empowerment efforts are needed through Community Service (PKM) activities aimed at improving community knowledge and skills in processing coconut shell waste into briquettes. This program not only provides technical training in briquette making but also provides education on business management so that the community can develop renewable energy-based businesses independently and sustainably. Through this activity, it is hoped that the community will be able to utilize coconut shell waste more optimally, reduce environmental impacts, and increase local economic potential through the development of biomass briquette businesses.

II. METHODS

The Community Service (PKM) program involved outreach on coconut shell briquette production and waste management. The program was implemented in the Laogo region. The PKM activity began with an outreach on coconut shell briquette production as an alternative energy source, targeting the Laogo community. The program began with remarks from local representatives and the PKM team leader to foster communication and build the local community. Before the outreach, the PKM team administered a questionnaire to participants to obtain baseline information about their knowledge of renewable energy, specifically coconut shell briquettes. This data provided important input for more effective program implementation. After collecting the questionnaires, the PKM team conducted outreach by explaining the benefits and uses of briquettes to participants. The material was delivered through a presentation, a question-and-answer session, and a briquette-making demonstration to help participants understand the concept of utilizing organic waste into a valuable product.

The next stage was an outreach on the economics of processing coconut shell waste into simple briquette fuel, followed by consultations and discussions. The FGD aimed to gain a clear picture of the obstacles and challenges the community would face in processing coconut shell waste into fuel briquettes, and to identify solutions tailored to the local conditions. At the conclusion of the outreach program, the Community Service Program (PKM) team administered an evaluation questionnaire to assess the benefits participants gained from the outreach activity. This information was used to evaluate the program's success and provide input for future implementation. Through these stages, the PKM program aims to increase community knowledge about utilizing coconut shell waste for briquettes and to enhance their capacity to manage renewable energy-based businesses. This approach is expected to create new business opportunities and sustainably support the local economy.

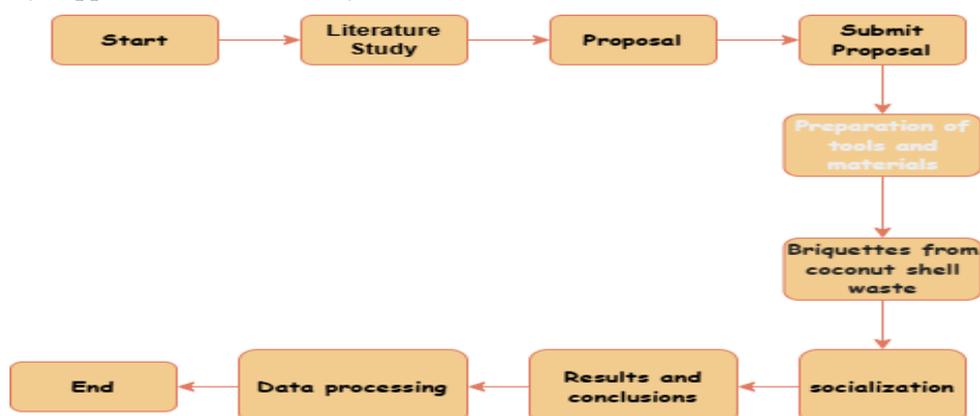


Fig 1. Implementation Flow Diagram

III. RESULT AND DISCUSSION

The Community Service Program (PKM) in the Laogo region has been implemented according to plan and stages, and the results indicate that the socialization regarding the manufacture of briquettes from coconut shells is good to implement. This is evident from the results of the initial questionnaire and evaluation, which showed an increase in participants' understanding of the process of making briquettes as an alternative fuel. Participants also gained knowledge related to the management of coconut shell waste processing businesses. The Laogo community stated that they would try to make briquettes independently. This enthusiasm was reflected in discussions, question and answer sessions during the PKM Training. Obstacles and challenges in processing coconut shell waste into briquettes include the community's lack of access to processing equipment, business capital, and knowledge of briquette making. Continuous mentoring and assistance with basic equipment are expected to be accepted by the community. The implementation of this PKM program proves that with appropriate socialization and training, the community can be invited to utilize organic waste into products with high economic value.

One key aspect of the success of this program is the discussions that involve the community in every stage of the activity. Thus, the community is not only a passive beneficiary but also plays an active role in developing benefits that are appropriate to their environmental conditions. This approach fosters a sense of ownership and responsibility for the initiative. Improving business management knowledge and skills is also crucial. The outreach program focused not only on the technical aspects of briquette making but also on how to effectively manage a small business. This is crucial for ensuring the sustainability of newly established businesses, especially in the face of market competition and economic challenges. However, the success of this program also highlighted several areas that require further attention. Barriers such as limited access to equipment and business capital require intervention from relevant parties, including the government and financial institutions. Support in the form of funding and facilities can be key to accelerating the adoption of new technologies and methods within the community. Overall, this Community Service Program (PKM) successfully achieved its primary objective of improving community knowledge and skills in utilizing coconut shell waste into briquettes. There is significant potential for similar training in other areas with similar conditions, and ongoing support is crucial to ensure long-term success.



Fig 2. Implementation documentation



Fig 2. Coconut shells turned into briquettes



Fig 3. Community outreach

IV. CONCLUSION

The Community Service Program (PKM) in the Laogo area successfully achieved its goal of improving community knowledge and skills related to utilizing coconut shell waste into briquettes. The outreach program demonstrated a significant increase in participants' understanding of the briquette-making process and its benefits as an alternative fuel. Furthermore, participants gained new knowledge about business management, which is essential for effectively running small and medium-sized enterprises. The positive response from the community, coupled with their interest in producing briquettes independently, indicates that the program's participatory and educational approach has successfully generated community interest and engagement. Focus Group Discussions (FGDs) identified barriers, such as a lack of access to equipment and business capital, and provided relevant solutions to address these challenges. The program's success underscores the importance of continued support from various parties, including the government and financial institutions, to ensure the sustainability and development of renewable energy-based businesses. The PKM program also demonstrates significant potential for similar initiatives in other areas, as well as the need for a comprehensive strategy to facilitate technology and methods within the community. Support in the form of funding, training, and provision of facilities will significantly contribute to accelerating the success of organic waste-based businesses.

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