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Utilization Of Tobacco Stalk Waste Into Briquette As Renewable Energy

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Abstrak

Pengolahan limbah batang tembakau menjadi briket memberikan kontribusi penting dalam mengurangi limbah tembakau yang melimpah di Desa Kledung. Selain mengurangi limbah, penggunaan briket di masa depan dapat menggantikan sumber energi yang semakin menipis. Pada umumnya, briket dibuat dengan bahan dasar tempurung kelapa, namun dalam pengabdian masyarakat di Desa Kledung ditemukan inovasi baru dengan menggunakan batang tembakau sebagai bahan dasar pembuatan briket. Pemilihan batang tembakau sebagai bahan dasar pembuatan briket didasarkan pada kekayaan sumber daya alam yang melimpah di Desa kledung. Pelaksanaan pelatihan pembuatan briket batang tembakau dilakukan dengan beberapa tahapan metode seperti penggalan sumber daya, uji coba, pelatihan, dan evaluasi hasil pelatihan. Tahapan-tahapan tersebut dilakukan dengan tujuan untuk memastikan sumber daya alam yang tersedia layak dan bermanfaat untuk dikelola. Hasil akhir dari kegiatan ini menunjukkan adanya peningkatan pemahaman dan keterampilan warga dalam mengolah limbah batang tembakau menjadi briket. Selain itu, pelatihan ini juga menjadi langkah awal dalam menjaga kelestarian ekosistem tanah, khususnya bagi masyarakat yang menggantungkan hidupnya pada pertanian.

Kata kunci: *Tembakau, Energi Terbaharukan, Briket, Ekosistem Tanah*

Abstract

Processing tobacco stalk waste into briquettes reduces Kledung Village's tobacco waste. This also presents a compelling prospect for replacing fossil fuels as a primary energy source. Briquettes are usually made from coconut shells. However, a community service initiative in Kledung Village has pioneered an innovative approach using tobacco stalks. The selection of tobacco stalks as the raw material for briquettes is grounded in the rich natural resources available in the village. The briquette-making training program was methodically executed, encompassing a series of stages, including resource exploration, experimental trials, comprehensive training, and a thorough evaluation of the training outcomes. This structured approach was adopted to ascertain the efficacy and sustainability of the available natural resources. The outcomes of this initiative revealed a substantial enhancement in the local community's comprehension and proficiency in converting tobacco stalk waste into briquettes. Moreover, the training initiative represents an initial step toward preserving the ecosystem, particularly for communities that rely on agriculture for their livelihoods.

Keywords: *Tobacco, Renewable Energy, Briquette, Soil Ecosystem*

INTRODUCTION

Indonesia is a country with a wealth of natural resources, including renewable alternative energy potential (Septianda, 2024). As the world becomes increasingly concerned about energy sustainability and protecting the environment, the need to explore alternative energy sources is becoming urgent. One of the most promising resources for

alternative energy is biomass. Biomass includes various types of waste, such as wood waste, rice husks, straw, bagasse, coconut shells, corn cobs, manure, and municipal solid waste (Wahyudi, 2006). In addition to providing an effective way to sustainably manage waste, these materials offer significant potential for renewable energy production (Elsa Nuraprilia et al., 2024). Kledung Village in Temanggung Regency, for instance, is an agricultural area rich in biomass potential. One of its main crops is tobacco. According to Anggit Triwahyu Widodo, Head of Horticulture and Plantation at the Food Security, Agriculture, and Fisheries Agency (DKPPP) of Temanggung Regency, approximately 2,172 hectares of tobacco fields are located in Kledung District. This makes Kledung one of the largest contributors to tobacco production in the region, playing a crucial role in supporting the local economy.

While tobacco farming significantly supports the local economy, it also generates a critical problem during harvest time. Farmers prioritize harvesting and selling tobacco leaves, leaving the stalks discarded as waste. These tobacco stalks are often abandoned in the fields, where the natural decomposition process can take months or even years due to their tough and fibrous composition. Over time, the buildup of this waste not only occupies valuable agricultural land that could otherwise be used productively but also leads to environmental challenges such as soil degradation and inefficient land use. This issue has raised concerns within the community, as the unutilized waste contributes to larger environmental challenges.

Given this problem and the potential of the village's biomass resources, processing tobacco stalk waste into renewable energy, such as briquettes, emerges as a viable solution. Biomass, including wood waste, has long been recognized as a renewable and abundant alternative to fossil fuels. Fossil fuels are a major contributor to environmental pollution and are increasingly being depleted. Their widespread use has led to severe consequences, including air and water contamination, greenhouse gas emissions, and global warming. Processing this waste into briquettes provides a sustainable way to repurpose agricultural by-products into a valuable energy source. Briquettes are compact, efficient, and eco-friendly fuel alternatives that have gained widespread acceptance in various communities (Callejón-Ferre & López-Martínez, 2009). They serve as a practical solution to address energy shortages while simultaneously reducing environmental waste. Research highlights the critical role of energy in supporting sustainable national development, encompassing social, economic, and environmental aspects (Logayah et al., 2023).

By converting tobacco stalk waste into briquettes, the community of Kledung has the opportunity to address multiple challenges simultaneously, such as waste management, energy security, and economic development. With Kledung's relatively cool weather, this initiative holds significant relevance and potential benefits for the local population. The region's cool weather has made briquettes a common choice for heating, creating a promising market for this renewable energy source. Moreover, this program empowers the community to transition from being mere consumers of energy into proactive producers of sustainable energy resources.

Recognizing this potential, Group 01 of the Community Service Program (Kuliah Pengabdian Masyarakat) from Universitas Sains Al-Qur'an has initiated a training program in Kledung Village to teach residents how to produce briquettes from tobacco wood waste. This program aims to promote the principles of sustainable resource management and regenerative economic practices, in addition to empowering the community with practical skills. This initiative aims to foster long-term economic resilience by equipping the local community with the knowledge and tools to transform waste into energy, while contributing to environmental conservation (Ramadhani et al., 2023).

In addition to addressing immediate community needs, this project also highlights the broader implications of biomass utilization as a renewable energy source. By adopting innovative approaches to waste management and energy production, Kledung Village can serve as a model for other agricultural communities facing similar challenges. This initiative demonstrates the transformative potential of integrating sustainable practices into rural development strategies, ensuring that economic progress is achieved without compromising environmental integrity. Such sustainable approaches align with the effective management of natural resources, which can further boost economic growth.

Natural resources not only satisfy domestic demands but also offer opportunities for international trade (Bakar et al., 2020). Proper management and sustainable utilization are essential to maximize these benefits while conserving resources for future generations.

METHODOLOGY

To implement the community service program, the Asset-Based Community Development (ABCD) method was adopted. ABCD is a development approach that emphasizes utilizing existing local resources, focusing on the strengths and assets of a community (Maulana, 2019). Asset-based community development comprises four key elements: resources, trials, training, and evaluation. The decision to apply ABCD was influenced by the unique conditions of the targeted area, where community resources, especially human and natural resources, remain underutilized. In Kledung Village, the community's tobacco farming groups and agricultural waste, such as tobacco stalks, offer opportunities for sustainable development. The program began with an observation phase to assess local resources, followed by training in briquette production from agricultural waste. This approach was tailored to the community's existing skills, promoting economic growth, waste management, and renewable energy production, while fostering sustainable practices for both environmental and economic benefits.

RESULTS AND DISCUSSION

The Community Service Group from Universitas Sains Al-Qur'an conducted a briquette-making training using tobacco stalks in Kledung Village on January 17, 2025, aiming to address the waste issue by repurposing agricultural by-products. This initiative was developed with the objective of reducing environmental waste and providing an innovative solution to support sustainable resource management. In addition, it aimed to create economic opportunities for the local community. By transforming tobacco stalks into briquettes, the project also introduced an alternative energy source, potentially alleviating the community's reliance on conventional fuels. The program was organized into four phases: resource assessment, trials, training, and evaluation. The first phase was an assessment of the potential human and natural resources, followed by trials to test the briquette production process. The training phase provides the community with the skills needed for briquette production, and the evaluation phase aimed to measure the program's effectiveness, ensuring its long-term impact on both economic development and environmental sustainability in Kledung Village.

1. Resource Observation

To implement the briquette-making training program from tobacco stalk waste, an initial survey was conducted to evaluate the available local resources and identify key challenges within Kledung Village. The survey revealed a significant amount of unutilized tobacco stalk waste, which has not been effectively managed. This waste presents significant environmental concerns, as the rigid stalks retain nicotine and decompose slowly, disrupting soil and ecosystem balance (Anwar et al., 2021). In response to these challenges, the Community Service Group from Universitas Sains Al-Qur'an developed a solution to recycle the tobacco stalk waste into briquettes. This proposed solution offers several advantages including reduced environmental disruption, use of renewable energy sources, cost-effectiveness, and the promotion of local economic development. Through this approach, the program aligns environmental sustainability with socioeconomic progress.



Picture 1. Resource Observation

2. Trials

The trial phase for producing briquettes from tobacco stalk waste was conducted independently by the Community Service Group of Universitas Sains Al-Qur'an. This phase aimed to ensure the success of the designed methods and techniques before engaging the local community. Initially, the necessary materials and tools were collected. The following is a list of items used during the trial process:

No	Item Name	Quantity
1.	Charcoal powder	1 kilogram
2.	Tapioca starch	200 grams
3.	Water	200 ml
4.	Oven	1 unit
5.	Stove	1 unit
6.	Pot	1 unit
7.	Basin	2 units
8.	Briquette mold	5 units
9.	Spoon	1 unit
10.	Bucket	1 unit

Once all the materials and tools were gathered, the trial proceeded through several carefully designed steps to achieve an optimal product:

- Mix 200 grams of tapioca flour with 200 ml of water.
- Heat the mixture over low heat for 3–5 minutes, stirring continuously until it forms a thick paste.
- Combine the tapioca paste with 1 kilogram of charcoal powder, mixing thoroughly until the dough is uniform and malleable.
- When the dough is no longer sticky, shape it using the prepared briquette molds.
- After molding, dry the briquettes either by sun-drying or baking them in the oven.

The trial results showed that the briquettes met the criteria and were suitable for implementation after drying. This stage of the production process determined the method's practicality and effectiveness, ensuring that materials and time were used efficiently. The success of this trial provides a solid foundation for conducting training sessions with the residents of Klodung Village. Documentation of the trial results will be provided.



Picture 2, 3, 4, 5, 6. Trial Results

3. Training

The tobacco stalk waste briquette-making training was held on January 17, 2025, at the front yard of the Head of Kledung Village. The event was attended by the village youth group and members of the Community Service Group from Universitas Sains Al-Qur'an. The training was specifically targeted to the village youth to optimize the results. The approach used in this training prioritized quality over quantity, with the goal of providing the participants with a deeper understanding of the process. The training followed the same procedure as the trial phase conducted earlier.

To enhance participants' understanding, the training began with a presentation on tobacco waste and renewable energy through briquettes. The material covered the environmental hazards of industrial waste, which is categorized into three main types: liquid waste, solid waste, and gas waste. Solid waste, such as tobacco stalks, was identified as a byproduct of household or agricultural activities, which consists of heterogeneous materials (Tuffahati & Novembrianto, 2024). In addition, the presentation emphasized that briquette utilization is an innovative solution for exploring alternative energy sources and reducing air pollution (Budi, 2017).

Following the presentation, the training continued with a demonstration of the briquette-making process by the Community Service Group members, following the steps from the earlier trial phase. To reinforce understanding, the village youth group was given the opportunity to directly practice the briquette production process. The training process was documented, providing a record of activities and outcomes.



Picture 7, 8, 9, 10. Tobacco stalk waste briquette-making training

4. Evaluation

This evaluation phase aims to assess the success of the tobacco stalk briquette-making training and its impact on the participants' understanding and skills. The evaluation activity starts with a group discussion about the training outcomes. This session enables participants to share their experiences and the challenges they faced during the briquette-making process. The discussion revealed that the youth group from Kledung Village had demonstrated a comprehensive understanding and practical proficiency in all the steps involved in the tobacco stalk briquette-making process, including material preparation and briquette drying.

To validate the participants' understanding, a burning test of the briquettes they produced was conducted. This test aimed to evaluate the quality and effectiveness of the briquettes as an alternative energy source. The burning results demonstrated that the briquettes were able to generate sufficient heat and could be used effectively, confirming the success of the training process. This evaluation not only reflects the participants' understanding but also provides evidence that tobacco stalk waste can be converted into a valuable renewable energy source. The entire series of training in this phase is depicted in the documentation below.



Picture 11, 12, 13. Trials and Evaluation

As a result of the briquette-making training from tobacco stalk waste, the community of Kledung Village, especially the youth group, has become more aware of the negative impacts of unmanaged waste. It has been demonstrated that tobacco stalk waste poses a significant environmental concern, as well as a disruption to the soil ecosystem balance, which can ultimately affect agricultural yields. However, challenges persist in ensuring the sustainability of this program and engaging the entire village community. It is hoped that the youth group, having participated in the training, will disseminate their knowledge to the broader community, thereby facilitating effective tobacco waste management. This program is expected to not only preserve soil ecosystem health but also provide economic benefits and serve as a model for other villages.

CONCLUSION

Natural resource wealth represents a valuable asset that merits appreciation, and this gratitude can be expressed through the wise use of these resources. The proper management of local natural resources has the potential to not only ensure the sustainability of the community's livelihoods but also generate long-term economic advantages. It is essential for every individual within a community to feel a sense of responsibility for preserving the integrity of these resources to ensure the balance of the ecosystem is maintained for future generations.

A case study of Kledung Village indicates that while the region is rich in natural resources, particularly tobacco, the challenge of managing the waste from tobacco harvests remains a pressing issue. The improper disposal of this waste can have serious environmental consequences, disrupting the balance of local ecosystems and affecting agricultural productivity. To address this, the training organized by the Community Service Group of Universitas Sains Al-Qur'an was designed to educate the villagers on the importance of converting waste into renewable energy. Through this training, the youth of

Kledung Village not only gained practical skills for managing tobacco waste but also developed a deeper understanding of the environmental risks posed by unregulated waste. The hope is that this initiative will encourage sustainable waste management practices, help preserve the local ecosystem, and serve as a model for other communities facing similar challenges.

SUGGESTIONS

1. It is recommended that the youth group in Kledung Village continue to share and distribute the knowledge gained from the briquette-making training to the broader community. This will help prevent environmental degradation, especially soil disruption. By empowering local youth to share knowledge, the program can foster community involvement, which is essential for environmental sustainability and ecological preservation.
2. It is crucial for the Kledung Village government to provide comprehensive support to the youth and community members interested in learning about the process of converting tobacco stalk waste into briquettes. This support may include providing materials, financial incentives, and technical assistance.
3. Conducting regular training sessions are key to improving briquette quality and skills. These sessions integrate new methods and innovations, and encourage learning and adaptability. Committing to quality improvement will strengthen the village's ability to use tobacco waste effectively and sustainably.

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