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Empowering the KWT Mentari through the Production of Biobriquettes from Nutmeg Waste in Wiyono Village

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ABSTRACT

Wiyono Village, Gedong Tataan District, Pesawaran Regency, has significant agricultural potential, including nutmeg. Often, underutilized nutmeg shell waste can become a source of environmental pollution. This community service program aims to empower members of the Mentari Women's Farmers Group (KWT) through training in the production of biobriquettes from nutmeg waste as a clean and affordable alternative fuel, while simultaneously increasing the participants' economic independence. The program involved 20 KWT members, using theory, hands-on practice, and independent mentoring, with support from lecturers from various study programs and two students. Pre-test and post-test evaluations showed an increase in participants' ability to produce biobriquettes from 50% to 90%. The training results fostered participant enthusiasm, strengthened technical and social capacity, reduced organic waste, and opened up new business opportunities. This program aligns with the principles of sustainable development (SDGs), particularly those related to clean energy, decent work, and inclusive economic growth. This activity can be used as a model for community empowerment based on agricultural waste management.

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INTRODUCTION

Wiyono Village, Gedong Tataan District, Pesawaran Regency, Lampung Province, has significant agricultural potential. One of the village's leading commodities is nutmeg. Nutmeg production in Lampung continues to increase annually, with BPS data (2024) reaching 0.5 thousand tons. Besides its high economic value, it also produces organic waste in the form of nutmeg skins. Currently, nutmeg waste is simply discarded without processing. Waste from the nutmeg oil refining industry is also unprocessed and can become a source of environmental pollution if left untreated, as explained by Kakerissa (2020), who emphasized the importance of nutmeg waste management to prevent environmental damage. As energy needs for households and small industries increase, communities remain heavily dependent on fossil fuels such as LPG and kerosene. Wahidin and Nuriana (2024) emphasized that fluctuations in the price and availability of fossil fuels encourage the search for more affordable and environmentally friendly alternative fuels. One potential alternative is utilizing organic waste, particularly nutmeg skins, as raw material for biobriquettes.

Biobriquettes are solid fuels made through the carbonization of organic waste mixed with natural binders. Safitri (2020) explains that the process of making biobriquettes is relatively simple, economical, and does not require a long time. The advantages of biobriquettes include high calorific value, low carbon emissions, and the ability to maintain stable combustion without requiring additional energy. Empowering the Mentari Women's Farmers Group (KWT) through training on biobriquette production from nutmeg shell waste aims (Kusuma, 2023; Singal, 2022):

- Identifying the potential of organic waste that can be utilized as raw material for biobriquettes.
- Providing technical training on the biobriquette manufacturing process, from raw material collection, carbonization, mixing with adhesives, to molding and drying.
- Increasing public understanding of the environmental and economic benefits of biobriquette production.
- Providing a cleaner and more affordable fuel alternative, thereby reducing dependence on fossil fuels.

This program involved 20 participants from the Mentari Women's Farmers Group (KWT), with the hope of increasing their independent biobriquette production capacity and opening up new business opportunities. This activity not only contributes to reducing the volume of organic waste but also reduces carbon emissions in Wiyono Village, while raising public awareness of the importance of sustainable innovation in agricultural waste management (Safitri, 2020; Kusuma, 2023). Beyond the technical aspects, this training also strengthens the social and economic capacity of KWT members. By producing and marketing biobriquettes, participants can earn additional income, increase economic independence, and build collaborative networks with village officials and other institutions.

Singal (2022) shows that empowering women through agricultural waste management has been proven to improve family welfare and support inclusive local economic development. The Sekar Melati KWT empowerment program, through the production of biobriquettes from nutmeg waste, emphasizes not only environmental and economic aspects but also strengthens local community capacity, empowers women, and promotes sustainable innovation. This approach aligns with the principles of sustainable development (SDGs), particularly those related to clean energy, decent work, and inclusive economic growth.

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METHOD

The Mentari KWT empowerment program, which involves producing biobriquettes from nutmeg shell waste, will be held in Wiyono Village, Gedong Tataan District, Pesawaran Regency, Lampung Province. The program is planned to last five days, encompassing theory, practical sessions, and independent mentoring sessions, to ensure participants fully understand the concepts and techniques of biobriquette production. Twenty members of the Mentari KWT, including the chairperson, secretary, treasurer, and active members, will participate, most of whom have junior high school or high school education backgrounds. Participants were selected based on their motivation and active involvement in agricultural activities and waste management in the village, in accordance with the principles of community empowerment outlined by Singal (2022).

The program begins with identifying the potential of nutmeg pulp waste in the village. The Community Service Program (PKM) team, along with participants, conducts an inventory of the quantity and characteristics of the waste, which will form the basis for planning biobriquette production. Next, participants receive theoretical training on biobriquettes, covering environmental and economic benefits, the carbonization process, the use of natural adhesives, molding, and drying (Safitri, 2020; Wahidin & Nuriana, 2024). This material is also complemented by discussions on marketing strategies and biobriquette business management, ensuring that this activity not only produces products but also increases participants' economic independence.

Following the theoretical presentation, participants engaged in hands-on biobriquette-making. The initial stage involved collecting and preparing raw materials, followed by carbonizing nutmeg pulp to produce biomass charcoal. The charcoal was then mixed with a natural binder, such as tapioca starch or other organic waste, before being molded using a simple mold and dried to an optimal moisture content. During the practical, participants were accompanied by the Community Service Program (PKM) team to ensure product quality met standards and to understand each stage of production (Kusuma, 2023).

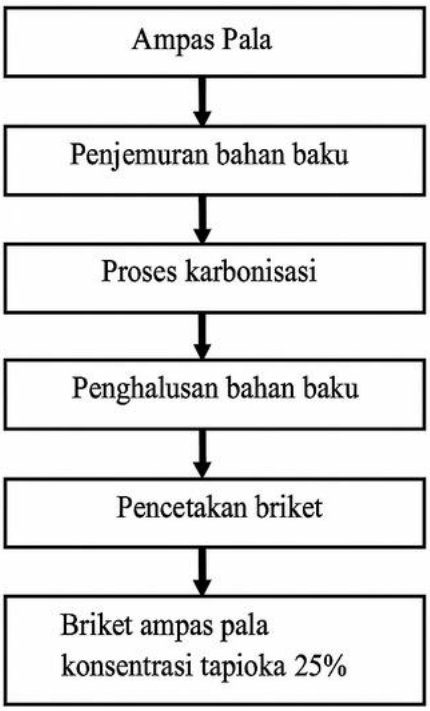

FIGURE 1. Briquette Making Flow Chart

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Following the practice, participants were allowed to independently produce biobriquettes under the team's supervision. Evaluation was conducted by assessing the physical quality, moisture content, and calorific value of the biobriquettes, as well as participants' understanding of the environmental and economic benefits of biobriquettes. This approach is expected to increase independent biobriquette production capacity, open new business opportunities, and raise awareness of the importance of sustainable waste management (Kakerissa, 2020; Safitri, 2020).

The material used in this study was nutmeg dregs. The dregs were first dried in the sun for 1-3 days, lasting 6 hours to reduce the water content. The water content before drying was around 8%; after drying, the water content was expected to decrease to 4% (Efendi, 2020). The sun-dried nutmeg dregs were then carbonized in a pyrolysis furnace at 200°C for 4 hours. The raw material was then ground using an 80-mesh disk mill. The raw material was then given a binder using tapioca flour at 25% of the weight of the raw material used, which was 1.000 kg. The raw material was then mixed with the binder and molded to a size of 2.5x2.5 cm. Furthermore, this program emphasizes women's empowerment and sustainable local economic development, in line with the principles of sustainable development (SDGs) related to clean energy and inclusive economic growth. A flowchart of the stages of this community empowerment activity is presented in Figure 1.

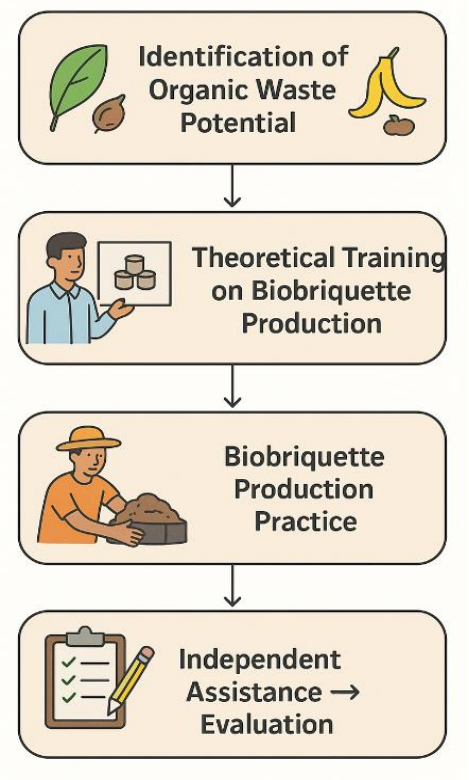

FIGURE 2. Flowchart of community empowerment activity stages

RESULTS AND DISCUSSION

The empowerment activities of the Mentari Women's Farmers Group (KWT) in Wiyono Village, Gedong Tataan District, Pesawaran Regency, Lampung Province, focused on the production of biobriquettes from nutmeg waste. This program aims to improve the skills of KWT members in processing agricultural waste into economically valuable products, while promoting environmentally friendly waste management practices (Hadi & Susanti, 2022). The training was attended by 20

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participants, consisting of active members of the Mentari KWT. The training took place on August 1, 2024, at the KWT head's home and began with remarks from the KWT head, who emphasized the importance of utilizing nutmeg waste to support community economic independence (Sandi & Setiawan, 2023). The training materials included an introduction to nutmeg waste, the benefits of biobriquettes, and a hands-on demonstration of biobriquette production. The lecture method combined with hands-on practice facilitated participants' understanding of the biobriquette production process. Participant competency was evaluated through a pre-test and post-test, as presented in Table 1. The pre-test results indicated that 50% of participants had basic knowledge of biobriquette production. After the training, 90% of participants were able and skilled in producing biobriquettes from nutmeg waste. This improvement demonstrates the effectiveness of the training approach and the participants' commitment to each stage of the activity (Wulandari & Santoso, 2021).

TABLE 1. Pre-test and Post-test Results of Nutmeg Waste Biobriquette Training Participants

Test Type	Number of Participants	Percentage	Description
Pre-test	20	50%	Basic initial understanding
Post-test	20	90%	Able and skilled at making biobriquettes

The participants' enthusiasm was evident in their active participation in the Q&A session and production practice sessions. Some participants even asked follow-up questions regarding the composition of the material mixture and the briquette drying method to improve product quality. This high level of participation indicates the KWT members' interest in developing a biobriquette-based business as a source of additional family income. This activity was supported by collaboration between lecturers across study programs and institutions, providing multidisciplinary experience for participants. Lecturers from Agrotechnology and Food Technology were involved in the preparation of technical materials, while lecturers from the Plantation Industry Production Management program provided perspectives on business development and group management. This cross-study collaboration enriched the training content and broadened participants' knowledge of comprehensive agricultural waste management (Damayanti & Putri, 2019). Two students were also involved in this activity as training assistants. The students helped demonstrate biobriquette making, guided participants, and documented each stage of the activity. The students' presence also provided an opportunity to learn directly about community empowerment practices and agricultural waste processing. The graph of the pre-test and post-test results of the nutmeg waste biobriquette training participants is presented in Figure 3.

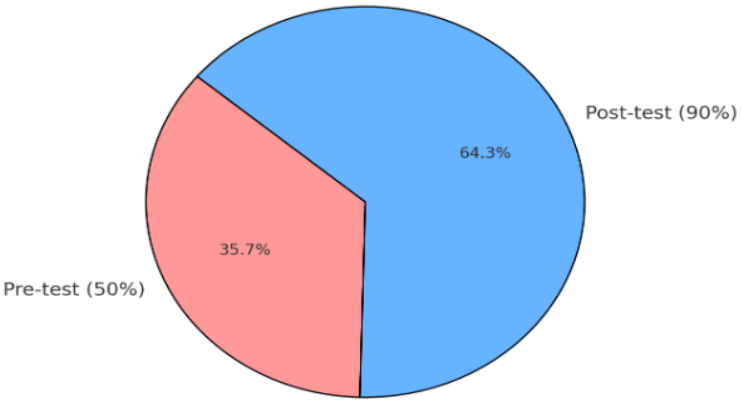

FIGURE 3. Graph of pre-test and post-test results of nutmeg waste biobriquette training participants

In addition to improving technical skills, this activity also fostered a sense of social responsibility

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among participants. KWT members began to understand the importance of productive waste utilization, enabling previously discarded waste to become a new economic resource. This aligns with the sustainable development goals of reducing waste and increasing village incomes (Harris & Yuliana, 2020). Overall, the training on producing biobriquettes from nutmeg waste successfully improved the knowledge, skills, and motivation of KWT Mentari members. The support of the Village Head, the involvement of lecturers from various study programs, and student participation proved crucial to the success of this activity. This training is expected to be sustainable and become a model for community empowerment based on agricultural waste processing in other villages. Documentation of the material delivery and the production of briquettes from nutmeg waste is presented in Figure 3-5.

FIGURE 4. Persentation nutmeg waste briquettes

FIGURE 5. Making nutmeg waste briquettes

In preliminary research, using the calorific value calculation process according to SNI No. 01.6235-2000, nutmeg dregs have a calorific value of 6333.36 cal/g, while good-quality briquettes must have a calorific value of at least 5000 calories per gram (cal/g). This indicates that nutmeg dregs briquettes have a calorific value higher than SNI and have great potential to be processed into renewable and environmentally friendly fuel. The finished briquette product is then subjected to an economic analysis with the following business assumptions:

- Production capacity: 1 ton (1,000 kg) per month
- Selling price: IDR 12,000/kg
- Raw material cost (nutmeg pulp is considered waste → IDR 0, only collection costs): IDR 500/kg
- Tapioca adhesive cost: IDR 2,000/kg (25% of briquette → 250 kg tapioca/ton) = IDR 500/kg of product
- Labor cost: IDR 2,000/kg

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- Energy & transportation cost: IDR 1,000/kg
- Equipment depreciation cost: IDR 500/kg
- Total production cost = IDR 4,000/kg

Financial Analysis

- Selling price = IDR 12,000/kg
- Production cost = IDR 4,000/kg
- Net profit per kg = IDR 8,000

If production 1,000 kg/month:

- Revenue = IDR 12,000,000
- Total costs = IDR 4,000,000
- Net profit = IDR 8,000,000/month

Break Even Point (BEP)

- BEP (kg) = Fixed costs / (Selling price – Variable costs per kg)
- For example, fixed costs (salaries, depreciation, fixed electricity) = IDR 2,000,000/month.
- Contribution margin per kg = IDR 8,000
- BEP = 2,000,000 / 8,000 = 250 kg

This means that after producing and selling 250 kg, the business has recovered its investment. It is hoped that this can continue and become one of the sources of income for women's farming groups.

FIGURE 6. Group photograph

CONCLUSION

The empowerment activity of the Mentari Women Farmers Group (KWT) in Wiyono Village, Gedong Tataan District, Pesawaran Regency, through the production of biobriquettes from nutmeg shell waste, has proven successful in increasing the technical capacity and understanding of participants regarding agricultural waste management. The training, which combines theory, direct practice, and independent mentoring, successfully increased participants' knowledge from 50% in the pre-test to 90% in the post-test,

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demonstrating the effectiveness of the applied method. In addition to the technical aspects, the program also fostered participants' enthusiasm in developing biobriquettes as a clean, economical, and environmentally friendly alternative fuel. Furthermore, the high economic value of briquettes can also become a new source of income. The involvement of lecturers from various study programs and institutions, as well as the support of two students as training assistants, enriched the material and experience of participants, while strengthening the collaborative network in waste-based business management. The program also succeeded in increasing the social and economic awareness of KWT members. By being able to produce and market biobriquettes, participants gain the opportunity to earn additional income, increase economic independence, and understand the importance of productive waste management. With this enthusiasm, it will increase further research to measure the quality value of nutmeg pulp briquettes.

REFERENCES

BPS. Produksi Perkebunan Rakyat Menurut Jenis Tanaman di Provinsi Lampung (ribu ton) Tahun 2024. 2024. https://lampung.bps.go.id/id/statistics-table/3/Y0hOWWFGZHpPVkpUVjFKUlowVjBhMUI1Wm1aWFp6MDkjMw==/produksi-perkebunan-rakyat-menurut-jenis-tanaman-di-provinsi-lampung--ribu-ton---2024.html

BSN. Standar Nasional Indonesia SNI No. 01.6235-2000 Tentang Briket. 2025. https://pesta.bsn.go.id/produk/detail/5750-sni01-6235-2000

Damayanti R, Putri D. Pemberdayaan Kelompok Wanita Tani dalam Pengolahan Limbah Pertanian Menjadi Produk Ekonomis. Jurnal Pemberdayaan Masyarakat. 2019;8(2):112-119.

Hadi S, Susanti D. Pemberdayaan Masyarakat Melalui Pengolahan Limbah Pertanian Menjadi Produk Bernilai Ekonomi. Jurnal Pengabdian Masyarakat. 2022;10(1):23-30.

Harris I, Yuliana E. Penerapan Teknologi Tepat Guna dalam Pengolahan Limbah Pertanian di Desa Sungai Langka. Jurnal Inovasi Teknologi. 2020;12(4):89-95.

Kakerissa AL. Pemanfaatan Limbah Tempurung Biji Pala sebagai Bahan Bakar Alternatif Briket Arang Biomassa. ALE Proceeding. 2020;3:33-39.

Kusuma HAW. Optimalisasi Pupuk Organik dari Limbah Batang Pisang dan Sabut Kelapa. Jurnal Pemberdayaan Masyarakat. 2023;5(2):45-52.

Sandi T, Setiawan A. Pemanfaatan Limbah Kulit Kakao Sebagai Pupuk Organik Cair Di Desa Wiyono Kecamatan Gedong Tataan Kabupaten Pesawaran. Jurnal Teknologi Pertanian. 2023;15(2):45-52.

Safitri ED. Pembuatan Briket dari Campuran Cangkang Biji Karet dan Tandan Kosong Kelapa Sawit. Skripsi, Universitas Islam Negeri Raden Intan Lampung. 2020.

Singal RZ. Pemberdayaan Kelompok Karang Taruna dalam Memanfaatkan Limbah Kelapa Sawit. Jurnal Pengabdian Masyarakat. 2022;7(1):12-20.

Wahidin N, Nuriana S. Bahan Bakar Biobriket Limbah Kelapa dan Kakao. Jurnal Penelitian Universitas Merdeka Madiun. 2024.

Wulandari C, Santoso L. Diversifikasi Produk Olahan Limbah Pertanian untuk Meningkatkan Pendapatan Petani. Jurnal Agribisnis. 2021;18(3):67-74.

https://doi.org/10.35568/abdimas.v9i1.7133