



Utilization of coconut shell waste into charcoal briquettes in Sungai Kupah Village, Kubu Raya Regency

Pemanfaatan limbah tempurung kelapa menjadi arang briket di Desa Sungai Kupah, Kabupaten Kubu Raya

Ely Nurhidayati, Erni Yuniarti, Nana Novita Pratiwi, Agustiah Wulandari, Firsta Rekayasa Hernovianty

Departemen Perencanaan Wilayah dan Kota, Fakultas Teknik, Universitas Tanjungpura
Jl. Profesor Dokter H. Hadari Nawawi, Bansir Laut, Pontianak, 78124, Indonesia

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ABSTRACT

The target villages located in Sungai Kupah Village, Sungai Kakap District, Kubu Raya Regency, West Kalimantan have potential in the agricultural sector, especially in the primary sector, namely coconut plantations. Most of the coconut harvest in Sungai Kupah Village only uses the flesh of the fruit which is processed as copra. Other parts such as shells and coconut husks are just thrown away, piled up, and not used. Therefore, the village development program can be an opportunity for the community to be able to process, utilize and increase the added value of coconut fruit products and coconut waste. This program is implemented by applying the offline method while still observing health protocols during the Covid-19 pandemic. The lecturer team and the student team carry out full community development and empowerment activities in the field using facilities, such as a hall as a place for socialization and training. The prospective development is coconut waste into charcoal briquettes. The implementation of this village development program is called PDKMI Briketku: Program Desa Kupah Mandiri Industri Arang Briket. As for the activities of the PDKMI "Briketku" village development program: Program Desa Kupah Mandiri Industri Arang Briket has been implemented. This village development program activity has resulted in the processing of coconut waste (coir and shell) into charcoal briquettes, as well as the packaging of charcoal briquette products with the brand "Briketku".

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1. INTRODUCTION

Independent Village Development in West Kalimantan Province was targeted by the Governor of West Kalimantan as many as 159 Independent Villages in 2020 and at least 425 Independent Villages in 2023. According to this program, Village Development activities and programs organized by the Faculty of Engineering can go hand in hand with the activities and programs of the Provincial Government West Kalimantan in achieving an independent village in West Kalimantan. The Ministry of Home Affairs of

the Republic of Indonesia has inaugurated the Acceleration Distribution and Management of Village Funds, one of which is regulated in the West Kalimantan Provincial Government Policy in Governor Regulation Number 1 of 2019 concerning the Acceleration of Increasing the Status of Village Progress and Independence.

According to the Kubu Raya Regency Regional Regulation Number 7 concerning the Kubu Raya Regency Spatial Plan (RTRW) 2016-2036, the regency's spatial planning aims to create a safe, comfortable, productive, environmentally friendly, and sustainable area. It is implemented in the agricultural and fishery sectors to develop coastal and urban areas in synergy with the agroindustry development sector, trade and services, culture and other sectors that support the development of the district and as the front porch of West Kalimantan Province. Sungai Kakap District aims to structure the development of an agricultural-based area with the concept of agribusiness and agroindustry. The agricultural designation area consists of food crop areas, horticultural areas, and plantation areas. The horticultural agribusiness center utilizes space for farmers settlements with low-density levels and the Development of Food Estate Areas.

Sungai Kakap District is an agricultural-based area and an agricultural designation area. So it is very feasible to diversify the results-and-processed products of the agricultural sector to become a Food Estate area. However, in reality, the potential for high agricultural yields cannot be managed both in a good production system and management system. This is due to the low level of public education, limited infrastructure and facilities, and the lack of information on industrial developments as the factors that cause the absence of products downstream (Ramadhia & Abdullah, 2017).

One area with a high potential for agricultural product yields is Sungai Kupah Village. The land area of Sungai Kupah Village is 35,024 km, and the water area is 8,576 km. Based on the profile of Sungai Kupah Village in 2020, Sungai Kupah Village has a total of 3,576 human resources, with the majority of them working as farmers. The majority of the livelihoods of the residents of Sungai Kupah Village in the agricultural sector cannot be separated from the potential possessed by the village that is in the primary sector, especially coconut plantations.

Sungai Kupah Village has the potential for development in the agricultural and plantation sectors with 2,649 hectares of coconut cultivation with a production yield of 1,009 tons per year. Most of the coconut harvest in Sungai Kupas Village only uses the fruit's flesh, which is processed as copra. Other parts such as shells and coconut coir are just thrown away, piled up, and not used. Over time, the coconut waste emits an unpleasant aroma and gives the impression of a slum environment in almost every hamlet of Sungai Kupah Village. This situation causes people to feel disturbed about the environmental impact caused by coconut waste. Under these conditions, efforts are needed to prevent problems caused by coconut waste. People can process, utilize, and increase the added value of products from coconut waste. For most of the people of Sungai Kupah Village, coconut coir and shells are just left alone, causing an accumulation of organic waste.

One of the coconut waste products that are currently prospective to be cultivated is charcoal briquettes, as shown in Figures 1-3. The manufacture of charcoal briquettes comes from a mixture of wood, bamboo, coconut coir and shells as an alternative energy source (Hendra, 2007). In addition, one of the alternative fuels made from organic waste, which has a varying calorific value depending on the raw materials used, is briquettes (Sulmiyati & Said, 2017). As one of the reductions in organic waste, the utilization of coconut waste can also help improve the city's cleanliness and air pollution due to the decomposition of coconut waste scattered on several hamlet roads in Sungai Kupah Village.

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Figure 1. Burning process of coconut coir

Figure 2. Drying process of coconut shells

Figure 3. Printing charcoal briquettes

Indonesia itself has exported charcoal briquettes to several countries, one of that is Turkey which receives a minimum of 2 (two) containers every month. The potential export value of coconut charcoal briquette products annually reaches USD 35 million (<https://www.katakini.com/artikel/41132/briket-arang-kelapa-indonesia-tembus-pasar-turki/>). Charcoal briquettes from Indonesia are also famous for their quality and are increasingly in demand by the international market. Until now, coconut shell charcoal briquettes have been exported to Turkey, Brazil, and several countries in Latin America, as shown in Figures 4 and 5 (<https://kemlu.go.id/jeddah/id/news/13339/arang-batu-bara-dari-indonesia-terkenal-dengan-kualitasnya-dan-semakin-diminati>). At the same time, as a global and national commitment to supporting sustainable development goals following SDGs (Sustainable Development Goals) Number 7 of Affordable and Clean Energy, Number 15 of Life on Land, and the issue of a "back to nature" lifestyle, the use of natural or organic materials, such as coconut waste produced must be carried out in sustainable and environmentally friendly manner.



Figure 4. Utilization of charcoal briquettes for culinary

Figure 5. Utilization of charcoal briquettes for shisha

Source: www.images.google.com

The utilization of coconut waste as a processed product that produces charcoal briquettes is expected to minimize the accumulation of coconut waste in Sungai Kupah Village. In addition, the use of coconut waste will also reduce the impression of slums and the smell caused by the pile of waste. Therefore, a program to utilize coconut waste in charcoal briquettes is needed to overcome local problems in Sungai Kupah Village. The output from the use of coconut waste also has the advantage of being sustainable and environmentally friendly because the products produced can be sold and improve

the local economy in Sungai Kupah Village. The people involved as the partner in the PDKMI Briketku activity is the organization of PKK (Pembinaan Kesejahteraan Keluarga) in Sungai Kupah Village.

The main problems for Partners include: 1) the abundant coconut waste has not been appropriately managed. Therefore, appropriate technology is needed to support the creative industry of local products, especially for processing coconuts and coconut waste. 2) There is no downstream product that is processed and packaged correctly in accordance with the MSMEs industry management system. This could be due to the low level of public education, limited infrastructure and facilities, and the lack of information on industrial developments. So that the role of stakeholders, especially academics, is needed to help increase the added value of coconut products through community development and empowerment through appropriate technology. 3) There is no marketing innovation for charcoal briquettes and coconut processing products, especially product packaging and ready to be marketed.

The purpose of this village development program is community development and empowerment through PDKMI "Briketku", a village development program organized by the Faculty of Engineering to foster and empower rural communities through appropriate technology so that they can add value-added to local products. The target of the PDKMI "Briketku" Village Development program is to implement the processing of coconut waste (coir and shell) into charcoal briquettes, as well as the packaging of briquette charcoal products with the brand "Briketku".

2. METHODS

This program is implemented by applying the offline method while still paying attention to health protocols during the Covid-19 pandemic. The team of five lecturers and a student team of 10 people carried out full coaching and community empowerment activities in the field using the facilities in the Sungai Kupah Village Hall Sungai Kakap District Kubu Raya Regency, as the place for socialization and training. The activity was conducted for 2 (two) meetings on August 25, 2021, from 10.00 to 12.00 WIB and on September 9, 2021, from 13.30 to 15.40 WIB.

PDKMI Briketku: Program Desa Kupa Mandiri Industri Arang Briket will be fully implemented in the field while still implementing health protocols. The lecturer and student teams act as initiators, the village government as a catalyst, farmer groups as technical implementers, and the people in Sungai Kupah Village as the implementers of the PDKMI program be fostered and empowered. Details of the roadmap can be seen in Figure 6.

The stages of the PDKMI "Briketku" Village Development Program include identifying potential and problems, the process and results of analyzing people needs, aligning with local regional development policies, preparing programs with the people of Sungai Kupah Village, determining target audiences, formulating and measuring success indicators, program implementation, strengthening village support for program implementation, steps for fostering target audiences, analysis of program success rates, pioneering partnerships, strengthening coordination and communication networks, monitoring and evaluating activities, the exhibition of activity results, and reporting.

3. RESULTS AND DISCUSSION

The results achieved in the PDKMI "Briketku" Village Development program in Sungai Kupah Village are following the activity and output targets, including: The target of this village development program, have resulted in the processing of coconut waste (coir and shell) into charcoal briquettes, as well as the packaging of charcoal briquette products with the brand "Briketku".

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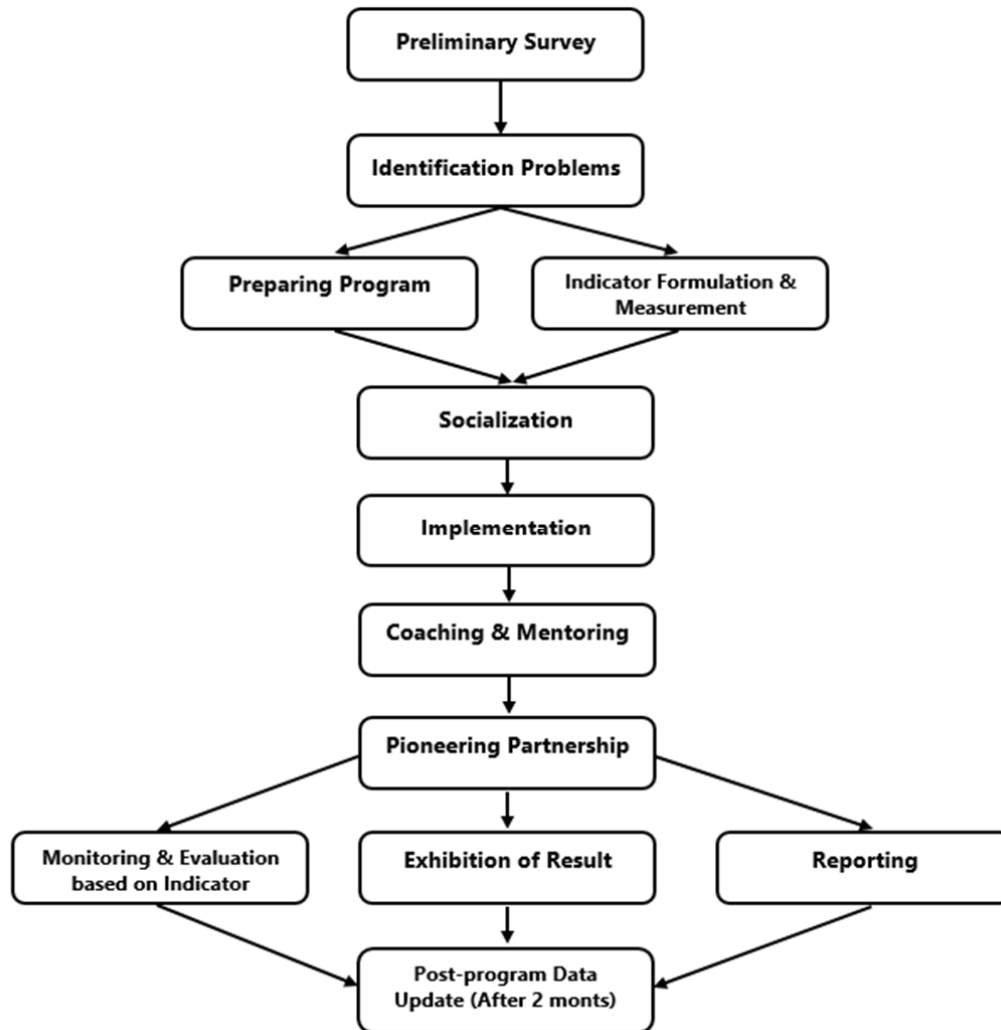


Figure 6. Roadmap detail

The activities of the PDKMI "Briketku" Village Development program consist of: First, the socialization of the Coconut Charcoal Briquette Waste Utilization program; Second, the Waste Utilization Program Training; Third, Assistance in Program Implementation. These three activities are solutions and targets in the village development program with the PDKMI theme "Briketku". The results of activities stages that have been achieved include:

Socialization of PDKMI "Briketku" Village Development Program

Socialization of the PDKMI "Briketku" Village Development Program was carried out in Sungai Kupah Village with a program to utilize coconut waste into charcoal briquettes. This socialization aims to introduce and provide information to the public regarding the utilization of coconut waste into products with a selling price. This socialization benefits from increasing public knowledge about the program to utilize coconut waste into charcoal briquettes. The socialization activities can be seen in Figures 7-10.



Figure 7. The registration process for the participant in PDKMI
"Briketku" Village Development Program Socialization

Figure 8. Material presentation



Figure 9. Participants and committees of PDKMI "Briketku" Village Development Program Socialization

Figure 10. Presentation of socialization material

Implementation of Coaching and Mentoring in Processing Coconut Waste into Briquette Charcoal to Packing Briquette Charcoal Products "Briketku"

Implementation of coaching and mentoring in processing coconut waste into charcoal briquettes to product packaging charcoal briquettes "Briketku" carried out by the village development team to train and assist village people to process coconut waste into charcoal briquettes to packaging that has a selling price. Implementation of coaching and mentoring is from processing coconut waste into charcoal briquettes to packaging briquette charcoal products. The village development team guides the form of knowledge related to the potential value of utilizing coconut waste into charcoal briquettes as a selling point to increase people's income.

The implementation of coaching and mentoring in processing coconut waste into charcoal briquettes for packaging briquette charcoal products aims to make all people able to process coconut waste into marketable products. The implementation of coaching and mentoring for processing coconut waste can be applied to the people of Sungai Kupah Village so that there will be no more burning coconut waste again in the future.

The process of burning coconut shells into charcoal by the village development team is shown in Figure 11. The village development team carried out this activity jointly, accompanied by coconut farmers. Coconut farmers look very enthusiastic and eager to follow the various stages of the briquette-making process: starting from burning coconut shells, refining coconut shell charcoal, boiling tapioca flour to bind coconut shell charcoal that has been mashed, then using a printer to print briquettes, and the last one is drying process.

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Making coconut shell charcoal begins with inserting coconut shell charcoal into the combustion drum, as shown in Figure 12. Then it is burned for 5 until 7 hours, and the ends are glued together with clay. After the coconut shell burning is complete, the combustion drum is left to cool for approximately 8 hours. After cooling, the drum is opened, then the coconut shell charcoal is separated from the ashes, and the coconut shell charcoal is removed from the combustion drum.

The coconut shell charcoal that has been removed from the combustion drum is then pulverized with a charcoal crusher until smooth, as shown in Figure 13. This is done to facilitate mixing with glue made from tapioca flour.



Figure 11. Process of making coconut shell charcoal

Figure 12. Burning process

Figure 13. Coconut shell charcoal

The next step is to mix the charcoal with tapioca flour proportionally between the glue and coconut shell charcoal. The adhesive is used to attract water and create a dense texture or glue two substrates to be glued by mixing tapioca starch water with charcoal powder, as shown in Figure 14.



Figure 14. Mixing process of the glue and charcoal powder, (a) Mixing the glue, (b) Stirring, (c) Mixing result, (d) Final result

Mixing the charcoal powder with tapioca flour adhesive is carried out according to a predetermined ratio and stirred until the mixture is mixed. Then the dough is put into a cylindrical mold with a diameter of 5 cm and a height of 5 cm, as shown in Figure 15, and then pressed using a manual wood press. The printed briquettes are then removed from the mold and dried using an oven. In the end, a design with the brand "Briquetku" can be added to give an attractive appearance on the packaging.



Figure 15. Process of making briquette charcoal, (a) Printing, (b) Cutting, (c) Drying, (d) Final result

Monitoring PDKMI “Briketku” Village Development Program

Monitoring is done online by telephone, and all tools for making charcoal briquettes, such as briquette printers and briquette ovens, are in good condition. However, there are difficulties in using the briquette printer because it is still used manually. The thing that will be considered in the future for the PDKMI Village Development team is that the briquette tool can be upgraded using an additional dynamo machine to turn and push the charcoal mixture so that the charcoal briquette molding process can be done using a machine.

Making PDKMI “Briketku” Village Development Program Report

Reports for the PDKMI “Briketku” Village Development programs have been made, namely through the website <https://milakubriketku.wordpress.com> and the Youtube Video “PDKMI Milaku dan Briketku”. Evidence of the PDKMI “Briketku” Village Development program report can be seen in Figure 16.

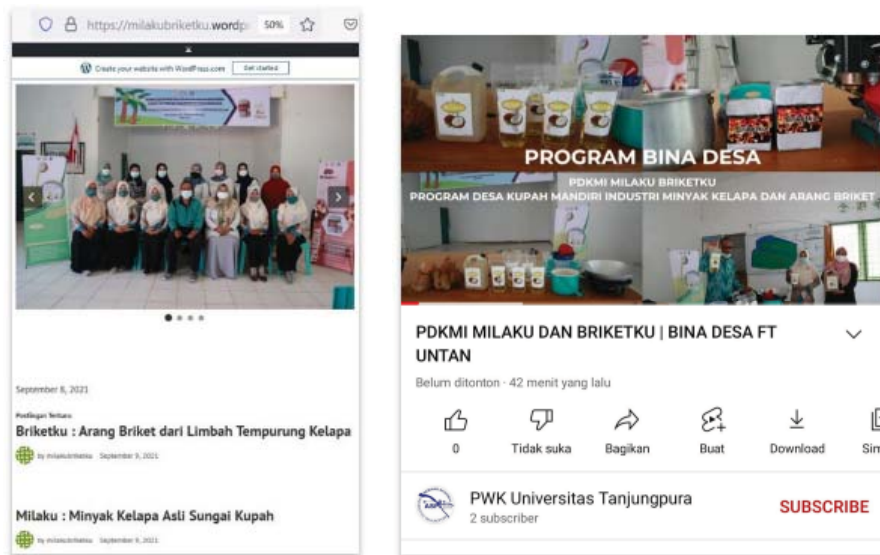


Figure 16. Report of the village development program, (a) Publication on the website, (b) Publication on the Youtube Channel

4. CONCLUSION AND RECOMMENDATIONS

The results achieved in the PDKMI Briketku Village Development program in Sungai Kupah Village follow the activity and output targets, including: The target of this village development program has resulted in the processing of coconut waste (coir and shell) into charcoal briquettes, as well as the packaging of charcoal briquette products with the brand "Briketku". The activities of the PDKMI Briketku village development program consist of: First, the socialization of the Utilization of Coconut Waste into Briquette Charcoal; Second, training on Coconut Waste Utilization Program; Third, Assistance in Program Implementation. These 3 (three) activities are solutions and targets in the village development program with the theme PDKMI Briketku.

It is necessary to increase the innovation of tools/materials and increase the scale in the production of charcoal briquettes, and this requires a large number of funds. With the availability of abundant coconut shell waste raw materials, the scale of the waste treatment must be balanced. In addition, the quality of the briquette charcoal produced is of local quality for the national market. In the future, it is hoped that Kupah Village can have a large-scale industry to add value to the quality of its charcoal briquettes. During the PDKMI Briketku activity, people were still thinking about the profit and loss in the production of charcoal briquettes due to the unbalanced price competition for coconut fruit and charcoal briquette products. Then it is necessary to deepen information regarding the limitations of coconuts due to the river channel in Sungai Kupah Village that does not flow well. This causes delays in the harvest of coconuts and the sustainable process of coconut oil production.

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