

Collaboration on The Use of Corn Cob Waste as Charcoal Brickets in Sukamulya Village

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Abstract

The Briquettes are solid fuels that are used as an alternative energy source that has a certain form and is an energy source derived from biomass which is commonly used as an alternative energy substitute for petroleum and other energy derived from fossils. Corn is one of the leading commodities in Sukamulya Village, Sematang Borang District, where corn production has increased from year to year. The goal to be achieved in this activity is to reduce pollution from corn cob waste and obtain an alternative technology as a substitute for fuel oil. Usually the remaining corn cobs that have been taken from the corn will be thrown away and burned just like that. Even though this corn cob can be processed to make briquettes that have marketability. Therefore the service team is interested in doing community service in the field of the Community Partnership Program with the title "Utilization of Corn Cob Waste as Charcoal Briquettes in Sukamulya Village, Sematang Borang District". The activities carried out are counseling and training in processing corn cobs into charcoal briquettes. Making charcoal briquettes consists of two processes, namely the carbonization of corn cobs and the making of the briquettes themselves. The benefits of this activity are being able to increase the insight of the people in Sukamulya Village regarding how to process corn cobs to become more useful as an alternative energy source, and reduce corn waste around the local community.

Keywords: Charcoal; Briquettes; Energy; Corn; Extension.

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Introduction

As the demand for fuel increases, fossil mining also increases. This is feared will lead to dwindling fossil fuel supplies, so that alternative fuels are needed as a substitute. Alternative fuels as an environmentally friendly energy source that can be used are briquettes (Tambaria, 2019).

Briquettes are solid fuels that can be used as an alternative energy source that has a certain form and is an energy source derived from biomass which is commonly used as an alternative energy to replace petroleum and other energy derived from fossils (Sugiharto, 2021). One of the potential sources of biomass energy in Indonesia is agricultural waste, such as rice

husk, straw, bagasse, corn stalks and cobs as well as other agricultural/plantation wastes. One of the potential agricultural wastes to be processed into alternative fuels is corncob, because of its abundant availability but it has not been utilized optimally (Rifdah, 2022).

Corn is one of the leading commodities in Sukamulya Village, Sematang Borang District, Palembang, where corn production has increased from year to year (Nugra, 2022). From each corn harvest it is estimated that approximately 65% of the corn (yield) is produced, while 35% is in the form of waste in the form of stalks, leaves, skins and corn cobs (Gusman, 2018). The high production of corn each year has an impact on the high waste generated, especially corncob waste. The easiest way to deal with this waste after the corn harvest is to burn it. From field observations it was found that corn cobs were not utilized and were thrown away or burned (Risal, 2021). It is known that the corn cobs produced are very rich in carbohydrates that can be used or processed into products that are useful and have economic value for human life (Irmawati, 2020). With the use of technology, the corncob waste can actually be developed into a product that has more economic value, one of which is used as briquettes. Basically, corncob waste is abundant but not optimally utilized. An idea arises to use it so that it has added value. Briquetting is an effective method for converting solid raw materials into a form of compaction that is more effective, efficient and easy to use. The reason for choosing corn cobs as the main ingredient is because the amount is very abundant and not optimal in its utilization and can even be said to be unused (waste).

This counseling activity can be used as an alternative problem solving in achieving the goals and expectations of the community regarding the utilization of waste, especially corn cobs and in line with the objectives of the community service program by embracing community groups so as to create an environment, a healthy quality of life and become an energy village. The target participants for this activity were the people of Sukamulya Village, Sematang Borang District, who are corn farmers whose corn products are sold to be processed into animal feed. Usually, the remaining corn cobs that have been taken by them are thrown away and burned just like that. One way to process agricultural waste into alternative fuels is carbonization followed by briquetting. Carbonization is the process of converting corn cobs into charcoal (carbon) through burning in a closed space with limited or minimal air so that not much ash is produced. This carbonization takes place in the temperature range of 300-500°C.

In this process, the smoke produced is condensed in a cooling pipe with a cooling medium in the form of well/river water with an inlet water temperature of +28 °C. The yield of charcoal produced is 17-24% with a yield of 3.5-6 liters of liquid smoke. Briquettes are lumps of charcoal made of hardened soft material. The factors that influence the properties of charcoal briquettes are the specific gravity of the material or the specific gravity of the charcoal powder, fineness of the powder, carbonization temperature, pressing pressure, and the mixing formula of the briquette raw materials. The briquetting process is a processing process that undergoes mashing, mixing of raw materials, printing with a hydraulic system and drying under certain conditions, so that briquettes are obtained which have a certain shape, physical size and chemical properties. This activity was based on research conducted by Virgiawan which analyzed the use of pioneer13 corn cobs as fuel for small-scale biomass power plants (PLTBM) using the direct combustion method (Virgiawan, 2022). In addition, Kapita and Fanumbi have made briquettes made from corn cobs in the utilization of coconut biomass waste and corn cobs for making briquettes (Kapita, 2021).

The selected partners are residents of RT 4, Sukamulya Village, Sematang Borang District. Most of them work as farmers. Corn farming in the Sukamulya area has great prospects for development. so that a lot of corncob waste is also produced. The head of the household is the sole source of livelihood. Housewives and adolescents of productive age do not yet have productive activities. This counseling program is expected to provide business opportunities to the community so that it can improve the economy. The resulting charcoal briquettes can be used to meet household needs or can be sold to the surrounding community. With the provision of training in making charcoal

briquettes from corn cobs, the community can make charcoal briquettes products independently so that expenses can be reduced and can even improve the household economy. Therefore, the knowledge and skills of the community in determining the composition of quality charcoal briquettes are still relatively low. Through the Community Service Program (PKM), a team of lecturers from Tridianti University will provide knowledge about charcoal briquettes from friendly corn cob waste. The activities carried out are in the form of counseling and training to the local community on how to process corn cobs into briquettes so that they have marketability. Village communities and farmers need to be educated and involved in the management of agricultural production waste such as corn commodities in order to have an economic impact of economic value for the community and farmer households. Therefore this program is in accordance with the needs and results of mapping problems in the field, namely related to how to reprocess corn production waste into products that can provide added economic value. Not only talking about the goal of reducing poverty, this program targets energy issues.

One of the planned output products is “Corn Cob Briquettes” which can later become an alternative to people's fuel needs. The community does not have to depend on the type of fuel for cooking such as gas, but can be diverted and accustomed to using Corn Cob Briquettes. Alternative energy is a way to overcome the current energy crisis, one alternative energy that can be utilized is biomass which has the potential to be developed into renewable energy (Moonti, 2022).

Research Method

Approach Method

The approach offered directly to the activity for approximately 2 months is to conduct counseling, training and evaluation of partners regarding the process of making Corn Cob Briquettes. There are several approach methods used in program implementation, including: 1) Program Socialization Socialization activities are carried out through surveys to community service partner locations, communicating with village officials and PKK administrators in Suka Mulya Village, Sematang Borang District; 2) Preparation for the Preparatory Activities carried out by the PKM team included preparing materials, videos of making Corn Cob Briquettes, attendance, participant certificates and participant feedback assessment forms on the implementation of activities. Preparation for activities is carried out to ensure all forms of completeness of the event so that activities can run smoothly; 3) Presentation of material to partners regarding problems faced by partners, namely the potential of Corn Cob Briquettes and its use in everyday life.

Partner Participation

PKM partners who are unproductive residents of RT 4 in Sukamulya Village, Sukamulya Village, Sematang Borang Palembang District. Participation of partners in the PKM program includes: 1) Partners as providers of places for organizing socialization activities, which are located in RT 4 of Sukamulya village, Sukamulya Village, Sematang Borang District, Palembang; 2) Partners act as socialization participants and play an active role in discussion / question and answer activities; 3) Partners are involved as a whole in the PKM program including problem formulation, program planning, activity scheduling, program implementation up to the activity evaluation stage.

Program Sustainability

After the entire program has been completed, it is important to plan for the continuation of the program. The continuation of the program in the field after the PKM activities are completed will include: 1) Monitoring the management of regional corn commodities and their diversified products; 2) Monitoring the production of Corn Cob Briquettes; 3) Dissemination of the marketing strategy for Corn Cob Briquettes.

Implementation of activities

Tools and materials

Canned drums, Matches, Starch, Corn Cobs, Grinding machines, Presses and Sieves

Making Charcoal Briquettes from Corn Cobs: The corncob waste that has been selected is put into the writing drum arranged in such a way that it is almost full, the drum is closed tightly then the fire is ignited through the ventilation hole/where the bottom of the drum is, the combustion process is allowed until all the ingredients are burned out.



Figure 1. Burnt corn cobs in a drum



Figure 2. The corn cob has been burned

After cooling, demolition is carried out and the resulting charcoal is separated from the remaining combustion ash for further processing.



Figure 3. Charcoal corn cobs

The charcoal from the carbonation process is ground or mashed and sieved then added to the starch and stirred until everything is evenly mixed.



Figure 4. The results of grinding charcoal are put in round molds

The finished dough is ready to be printed into briquettes with a cube or cylinder shape by placing the dough into the mold and then pressing it with a press.



Figure 5. Pressing corncob charcoal briquettes

Charcoal briquettes that have been printed are then dried/dried in the sun until completely dry and the briquettes are ready to be used for household purposes as an alternative fuel.



Figure 6. Drying of charcoal briquettes from corn cobs

The Service Team went directly to the field and had discussions with the farmers about the aims and objectives of this service activity. Seeing the method offered, the farmers welcomed and partnered to provide materials and places for processing charcoal briquettes later.

Results & Discussion

The current energy crisis is a problem that has a very big impact because energy is a source of primary needs for the wider community. The fluctuating increase in world oil prices will exacerbate this situation. The development of alternative energy sources to the currently available energy sources still needs to be done. One that can be used as a new energy source is briquettes. (Aryani, 2017).

Seeing the condition of housewives who often have difficulty getting gas fuel for the team of lecturers from Tridinanti University, especially the Faculty of Engineering, took the initiative to provide socialization and training programs to the community in producing Briquettes made from Corn Cobs. In order to anticipate the limitations of natural gas and save the people's economy, the idea emerged to use waste from corn cobs which were processed into charcoal briquette fuel as a substitute for wood, oil and gas to become cheap alternative fuels.

Based on research by Sulistyningkarti & Budiman stated that to make charcoal briquettes from corn cobs the best adhesive is to use starch or tapioca flour. Corn cob charcoal briquettes with tapioca adhesive had better quality in terms of moisture content, volatile matter content, ash content, bound carbon content and calorific value compared to wheat flour. The use of corn cobs will produce a high calorific value (Sulistyningkarti & Budiman, 2017).

Briquettes with an adhesive percentage of 5% have better quality than adhesive percentages of 10% and 15%. The characteristics of the best corncob organic waste charcoal briquettes are a moisture content of 3.67%, an ash content of 4.83%, an evaporative content of 11.01%, a bound carbon content

of 80.52% and a calorific value of 56663 (Gusman, 2018) . Where with these characteristics have met the quality standards of SNI 01-6235-2000.

The implementation of this community service program is located in the Sukamulya Village Sub-District, which has an area of 11,125 m² with a population of 7689 people, a male population of 3906 people and 3783 women (BPS Kota Palembang, 2021). The majority of the people's livelihood, especially in Sukamulya Village, are farmers and planters, while the women are mostly housewives without a steady income. The majority of the population work as farmers, both food crop, horticulture, crops and plantation farmers. One type of plant that has the potential to be developed is corn.

The potential for product development from waste/harvest residue and processing of corn in Sukamulya Village is quite high. In addition to selling raw materials and food from processed corn, the community can also sell processed waste. The average amount of corn production, which reaches 4.3 tonnes/ha, leaves about 37% of waste that the community does not use, whereas if the crop is only used for the seeds, the resulting waste weighs 1.5 times the weight of the beans produced. This waste contains high hemicellulose and lignin, so it has the potential to be used as briquettes. In the process of making briquettes, the selected corncob waste is put into the writing drum arranged in such a way that it is almost full, the drum is closed tightly then the fire is ignited through the ventilation hole/where the bottom of the drum is, the combustion process is allowed so that all the materials burn out. After it cools, it is demolished and the resulting charcoal is separated from the remaining combustion ash for further processing.

Counseling and training activities for making Corn Cob Briquettes were carried out by 5 lecturers from Tridinanti University Palembang who were assisted by 10 KKN students where the activities were carried out on Monday, January 10 2022 at the Sukamulya Lurah Office, Sematang Borang District, Palembang. The atmosphere of socialization activities and training for making Corn Cob Briquettes to the public can be seen in Figure 1, where students demonstrated directly the process of making corn cob briquettes and how they are used for household fuel needs. The socialization and training activities were attended by 28 participants (the Sukamulya Village community). Female participants (housewives) tend to be more enthusiastic about participating in the training, as shown in Figures 7 and 8.



Figure 7. Socialization Activities



Figure 8. Charcoal Briquette Making Training



Figure 9. Sharing and discussion with partners

The results of the training activities for making Corn Cob Briquettes, especially in the aim of forming the knowledge and attitudes of the community so that they are able to produce briquettes independently and apply the use of briquettes as an alternative fuel in households are presented in Table 1.

Tabel 1
Results of Activities

Component	Target (%)	Results (%)
Number of participants	100(30 persons)	93,3 (28 persons)
Participants are able to understand the material	100	75
Participants are able to make their own briquettes	75	86
Participants want to try to make their own for household needs	75	40
Participants want to try to make their own for business purposes	50	11

From the table 1 shows that the number of participants who attended was 28 people from the planned target of 30 participants. The target of participants is only limited to 30 people due to considerations of the pandemic situation. The component of the knowledge aspect of the participants was classified as not exceeding the target, where only 75% of the participants were able to understand the material. The component aspect of the participants' ability to make briquettes independently was classified as exceeding the target, while on the attitude aspect the people who were interested in applying it for household needs or for business purposes had not met the target. This is caused by the busy factor society (time consumed in farmer's activities), there is still community behavior that tends to like instant things, and dependence on conventional fuels.

In the future, the community is expected to be able to utilize Corn Cob Briquettes to meet energy needs for households as well as for economic and business purposes.

After the briquette making tool was applied to the community service activities partner group, monitoring and evaluation of the manufacture of charcoal briquettes as an alternative energy was carried out. So that charcoal briquettes can be an alternative energy for the surrounding community. In addition, the community service team will also evaluate whether the carbonization furnace and briquette presses can work properly. One month later, visits and monitoring were also held to the community service activities partners to see the success of making charcoal briquettes, the function of the tools and see the obstacles that existed in the field.

Conclusions

In the training activities for making Corn Cob Briquettes, the components of the participants' knowledge aspects were classified as having not exceeded the target, where only 75% of the participants were able to understand the material. The component aspect of the participants' ability to

make briquettes independently was classified as exceeding the target, while on the attitude aspect the people who were interested in applying it for household needs or for business purposes had not met the target. Meanwhile, in the activity of making handicraft products from Corn Cob, the components of the knowledge aspect of the participants were classified as having not exceeded the target, where only 75% of the participants were able to understand the material. The component aspect of the participants' ability to make briquettes independently was classified as exceeding the target, while on the attitude aspect the people who were interested in applying it for home decoration needs or for business purposes had not met the target. The community service activities carried out have been successful, the PKM partner community as the target audience is very enthusiastic in participating in each stage of the training activities for making charcoal briquettes from corn cobs. Through this community service program, the residents of the Sukamulya sub-district, Sematang Borang Subdistrict, Palembang City, gain knowledge about the use of corncob waste which has economic value and find a source of livelihood for the community in the form of charcoal briquettes as an alternative energy fuel.

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