Journal of Social Work and Science Education
Volume 3 (3) 2022
E-ISSN: 2723-6919 P-ISSN: 2746-0827

Training on Making Briquettes from Rice Husk Waste as an Alternative Fuel

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Article History: Received on 21 September 2022, Revised on 19 November 2022, Published on 29 December 2022

Abstract

The large number of farmers harvesting rice in peat areas, especially in Malintang village, creates mountains or piles of rice husks along the road. Because the peat area is an agricultural area, there is a lot of rice husk waste. Based on the initial observation of the facilitator team to the community in Malintang village, most people use this rice husk waste for gardening purposes such as being used as a mixture of fertilizer or animal feed. However, this rice husk waste has not been optimally utilized as an alternative fuel. Therefore, the facilitator team wants to facilitate training in making this briquette into one of the alternative energies that can be used by peat communities, especially in Malintang sub-district. This training aims to (1) provide education to the people of Gambut District about the benefits of briquettes as an alternative fuel, (2) provide training to the community on how to make briquettes as an alternative fuel, (3) find out the perception of the peat community regarding briquettes as an alternative fuel. Based on the results of the questionnaire analysis, it was found that 75% of the public's perception of briquette making was that they did not know about how to make briquettes and how to use them, however after training the community had received education about the use of rice husk waste into briquettes.

Keywords: Alternative Energy, Briquette Making, Fuel, Rice Husk

A. Introduction

Briquettes are briquettes made from raw materials derived from biomass waste, such as charcoal, wood dust, coconut shells and rice husks. Briquettes are generally used as an efficient and environmentally friendly alternative fuel, especially in replacing fossil fuels such as coal

or kerosene. The process of making briquettes involves compacting the raw materials into a solid form using high pressure, without the need for additional adhesives. The main advantages of using biomass briquettes are (1) environmentally friendly because the raw material for biomass briquettes comes from organic waste, so their use reduces greenhouse gas emissions and minimizes negative impacts on the environment (Ferronato et al., 2022). (2) Energy efficiency because briquettes have a high calorific value and can produce sufficient heat for various applications, such as space heating, cooking, or drying (Kayode, 2021) . (3) Local Energy Source because briquette production can be done locally using raw materials available in the area, thereby supporting the local economy and reducing dependence on fossil fuels which must be imported from outside (Siregar et al., 2020). (4) Low Cost: Raw materials for making biomass briquettes are often cheaper or even free, because they come from agricultural or wood industry waste that was previously considered waste (Kipngetich et al., 2022). (5) Waste Management: Using biomass waste to make briquettes helps in waste management, by reducing the amount of waste that has to be thrown away or burned uncontrollably (Akolgo et al., 2021).

To make briquettes, you can use appropriate tools and materials, such as charcoal sieving machines, charcoal size reduction machines, charcoal flouring machines, dough mixing machines, charcoal dough kneading machines, briquette printing machines, briquette drying ovens, and briquette cutting machines (Ramadhini et al., 2021). Making briquettes is important because they can be used as an alternative energy source that is more efficient, economical, safe and environmentally friendly (Bisen et al., 2021). Briquettes can be produced from waste natural resources such as coconut shells, wood, waste, peat, straw and sawdust, reducing waste and helping to save costs on fuel oil usage (Cholis et al., 2021). In addition, briquette making can facilitate the exchange of knowledge and experience, help in improving the quality and standards of briquettes, and has the potential to preserve forests (Navalta et al., 2020).

Even though they have many advantages, there are also several challenges that need to be overcome in using biomass briquettes, such as quality control of raw materials, appropriate production technology, and public education about the benefits and how to use them (Magnago et al., 2020). However, as an environmentally friendly and efficient alternative fuel, biomass briquettes have great potential to become an important part of sustainable energy solutions in the future (Ismayana & Afriyanto, 2011).

B Rickets can be made from various types of charcoal such as; (1) Wood charcoal can be made from various types of wood, such as teak wood, meranti wood, and teak wood. Wood charcoal has a high calorific value, so wood charcoal briquettes are very suitable for use as charcoal fuel (Akpenpuun et al., 2020). (2) Coconut shell charcoal can be made from mature coconut shells. Coconut shell charcoal has a lower calorific value than wood charcoal, so its use as an alternative fuel must be adjusted to energy needs (Adam et al., 2021). (3) Rice husk charcoal can be made from cooked rice husks. Rice husk charcoal has a lower calorific value than wood charcoal, so its use as an alternative fuel must be adjusted to energy needs (Yusuf et al., 2021). (4) Coconut shell charcoal can be made from mature coconut shells. Coconut shell charcoal has a lower calorific value than wood charcoal, so its use as an alternative fuel must be adjusted to energy needs (Okwu et al., 2022).

Along the stretch of road in the Gambut area, especially Malintang Village, many people harvest rice. After harvesting, people immediately decompose the rice with the dregs. This causes large piles of rice husk waste to be scattered and piled up. Based on interviews with local residents, the rice dregs are mostly used for animal feed, eggplant gardening, garden

fertilizer husks, and making road walls. So the rice dregs have never been used for other things, such as making briquettes as an alternative fuel. Based on research results (Qistina et al., 2016) related to the quality test of rice husk briquettes through a semi-carbonation process at a temperature of 50-125 with a duration of 50-120 minutes, the results obtained were that the energy produced reached 8.54% and contained gas emissions below the required quality standards.

From the research conducted (Qistina et al., 2016) shows that rice husk briquettes can be used for alternative energy so that they can be utilized by the community to meet energy needs. Alternative energy from rice husk briquettes can be used by people for cooking such as boiling water, frying fish, grilling fish and so on. It can even be used by street vendors such as selling meatballs which require continuous heating of the meatball sauce or satay traders who need charcoal. To burn satay, these rice husk briquettes can be used as environmentally friendly alternative energy with minimal smoke and longer burning resistance. However, the problem is that people do not understand the use of rice husk waste into alternative energy and how to make briquettes from rice husks and the use of the briquettes themselves.

Therefore, the facilitator wants to hold training on making briquettes from rice husk waste as an alternative fuel. Therefore, the facilitator wants to hold training on making briquettes from rice husk waste as an alternative fuel which aims to: (1) Reduce the amount of rice husk waste, which should be used to provide added value to society; (2) Fulfilling the need for alternative fuel sources that are more efficient, economical, safe and environmentally friendly; (3) Facilitate the exchange of knowledge and experience, assist in improving the quality and standards of briquettes, and have the potential to preserve forests; (4) Improving the economy of the people of Malintang Village, who have rice husk waste which can be processed into rice husk charcoal biobriquettes; (5) Helps save costs on fuel oil, which can be used for household, industrial and office needs; (6) This training will also include making a briquette press and understanding how to compound rice husks.

B. Methods

Place of execution

This community service implementation was carried out in Malintang Gambut Village, Banjar Regency, South Kalimantan.

Implementation Method

The community empowerment method implemented in training on making briquettes from rice husk waste as an alternative fuel is;

Counseling

Extension involves the collection and transmission of information, education, and development of community capabilities. In this training, the public is given information about the process of making briquettes, their benefits, and how to use them as alternative fuel.

Training

The training involves theoretical and practical education about the process of making briquettes, the tools and materials used, and how to use briquettes as an alternative fuel. This training also includes making a briquette press and understanding how to compose rice husks.

Accompaniment

Mentoring involves assistance, advice, and technical and financial support from facilitators and other agencies. In this training, the facilitator will provide technical assistance and advice, as well as assist the community in starting a briquette making business.

Participation

Participation involves people's experiences and abilities in making decisions that affect them. In this training, the public will have the ability to make decisions about the briquette making process, briquette quality, and briquette marketing.

Alternative Programs or Activities (designing)

In this stage, the existing empowerment program will not only take place as a charity program, but will aim to help the community in solving various problems.

Preparatory stage (engagement)

This preparation stage has the substance of emphasizing two important elements, namely officer preparation and field preparation. This stage is a prerequisite stage for the success or failure of an empowerment program.

Participatory Learning and Action (PLA)

The PLA method or Participatory Learning and Action (PLA) is expected to allow the community to explore and share knowledge for the context of decision making, planning and implementing actions to bring about change in a positive direction, and improve the quality of life personally or in the community environment.

Field School (SL)

SL is a periodic meeting activity held by a group of people in a certain area, which begins with discussing the problems being faced, then followed by brainstorming, sharing experiences, about alternatives and the most effective and efficient ways of solving a problem according to resources. which exists.

Subject

The assisted subjects in the service of making briquettes from rice husk waste as an alternative fuel are the people of the peat sub-district in Malintang Village, as well as the people who live around the rice fields of the peat sub-district. This is because this service aims to improve the community's economy, reduce the amount of rice husk waste, and develop the ability to make briquettes as an alternative fuel source that is more efficient, economical, safe and environmentally friendly.

Subject Condition

The condition of the mentoring subjects at that time did not understand the other benefits of husk waste so they were not able to explore surrounding sources for alternative energy. However, with training in making briquettes from rice husk waste as an alternative fuel, people will start from the basics to understand the other benefits of husk waste. This training will help people understand the process of making briquettes, their benefits, and how to use them as

alternative fuel. With this training, the community will better understand the other benefits of husk waste and be able to explore local sources for alternative energy.

C. Results and Discussion

The following explains further the results of the implementation of briquette making training service activities in Malintang village, Gambut district.

Target Beneficiaries

This service activity was carried out during the Covid-19 pandemic, where these conditions required people to keep their distance, prioritize health protocols and avoid creating crowds. In accordance with the guardian's circular that gathering and creating crowds is prohibited, wearing masks and maintaining distance is mandatory. Therefore, the implementation of this service is limited to being carried out on a small scale divided into 2 stages for each activity consisting of 12 people per session with a total of 24 community members accompanied by cadres.

This briquette making training activity is an activity that requires dedication, patience and skill. Therefore, the target group consisted of 24 male and female participants who were recruited as participants because they were considered worthy of being developed independently in coordination. The residents chosen are mainly those who have the time and are suited to the residents' conditions as farmers, housewives, entrepreneurs or employees who can take part in training well. Because the expected target in the training is that the community can get to know or know about information about the processing of this husk waste which is very abundant in the environment where they live and it is hoped that after attending the training the community will be interested in developing briquettes and can be used in everyday life and can even become a commodity.

The selected communities have expressed their willingness to take part in training based on interest, not too far away from where they live, namely one neighborhood in Malintang village, based on will, not coercion, and the ability to process this husk waste into briquettes. So that fathers and mothers can become participants in this training. Even the RT head and village head were very enthusiastic about taking part in this training.

Forms of Extension Activities

The form of briquette making training activity starts with cadres of students and community members who are willing to come out to provide counseling and training assistance. After the cadre formation, 3 students were obtained from the chemistry school and 3 students from the biology school of UIN Antasari. Apart from that, cadre formation was also carried out with 10 members of the public who were interested in accompanying them during counseling and training.

The counseling is carried out online (on the network) by resource persons, namely Mr. Ardian Trio Wicaksono, S.Si., S.Pd., M.Pd and Mrs. Dwi Rasy Mujiyanti, S.Si., M.Si, while the counseling is offline (outside the network) assisted by cadres. Then the practice of making briquettes is carried out offline accompanied by cadres and a team of facilitators. Online counseling in the form of theoretical explanations about rice husk waste, rice husk briquettes and the use of rice husks as a material for making alternative fuel briquettes is carried out online starting from an online webinar and participants are not limited to just training participants but

are also open to the public. Then the next implementation was a practice carried out offline with 24 participants from the community of Malintang Village, Gambut District, which was carried out in the Village Hall, Office of the Head of Malintang Village, Gambut District.

On line

Education to the public regarding alternative energy began online via online webinars, with activities assisted remotely by the activity committee. The aim of holding the online webinar is to provide information and an overview of the benefits of rice husks as alternative energy. The webinar was held using the Google Meeting Room platform.

Figure 1. Webinar *flyer*

The material presented by the first resource person includes an introduction to alternative energy, one of which is biofuel to meet household needs and electricity, so it will be relevant to the training theme, namely making briquettes as an alternative energy source that is environmentally friendly. The next material is about biomass energy, which in this training is rice husks. Rice husks are one of several biomasses. The speaker further explained about briquettes themselves, briquette adhesive materials, criteria for briquette fuel, making briquettes from rice husks and even explained examples of the use of briquettes.

Figure 2. Material from the first resource person

Meanwhile, the material from the second resource person included the chemical composition of rice husks, the benefits of rice husks, various forms of briquettes, requirements for good briquettes, advantages of briquettes and briquette quality parameters.

Figure 3. Material from the second source

Offline

Training on making briquettes and its implementation was carried out in the Malintang Village Hall, Gambut District, with 24 local residents participating, accompanied by cadres and a team of facilitators. Residents from various groups, ranging from farmers, housewives, traders to village office employees took part in the training.

Figure 4. Briquette Making Training Banner

Activities are carried out by observing health protocols and maintaining distance. The protocols prepared for participants include masks, face shields, hand sanitizer and checking body temperature.

Figure 4. Implementation of health protocols during training

The implementation of this briquette making training begins with offline outreach to the community first. The education material includes an introduction to briquettes, types of briquettes, and how to make rice husk briquettes. Then this offline practical activity is accompanied by the provision of health facilities in the form of implementing health protocols. Apart from that, training participants also receive facilities in the form of masks, training clothes, tootbags containing books, pens and materials. To encourage the enthusiasm of the training participants, the committee also demonstrated the use of briquettes on a briquette stove,

and lucky participants received a briquette stove. Then the training participants were given an evaluation regarding the use of briquettes.

Briquette Making Training Activity Process

Briquette making

Burning rice husks into rice husk charcoal

Figure 5. Process of burning rice husks into husk charcoal

Grind the rice husk charcoal by pounding it, then filter it using a sieve.

Figure 6. Process of refining husk charcoal

Make adhesive (glue) from starch diluted with water in a ratio of 5:1 (starch: water).

Figure 7. Making glue from starch and water Comparison (5:1)

Mix the glue mixture with burnt rice husks in a ratio of 1: 7 (starch mixture: rice husk charcoal)

Figure 8. Mixing starch glue and rice husk charcoal (1 : 7)

The mixture is put into the pipe, then compacted and slowly removed from the pipe. Apart from that, you can also use a hydraulic press.

Figure 9. Briquette molding tool

Drying the molded briquettes in the sun.

Figure 10. Drying briquettes

After the counseling was carried out, it was continued with training in making briquettes with the community according to the stages of making briquettes.

Figure 11. Briquette making training activities

Monitoring

After the training, the next activity is monitoring and mentoring to see the progress of the briquette making that has been carried out by the community, because during the training the participants have reached the stage of making briquettes, whereas after the training the briquettes that have been made will need time to dry so they are ready to be used.

Testing activities

Briquette testing activities using a briquette stove as a testing facility. Stoves were distributed to lucky participants, then the committee distributed stoves to the village head, local RT head, and several members of the community. To evaluate the use of briquette stoves, direct interviews were also conducted with people who use the briquette stoves. From the results of interviews, people tend not to experience difficulties in using stoves and feel interested in using rice husk briquettes as an alternative fuel. It's just that in the Gambut area, especially Malintang Village, there is still no one producing these rice husk briquettes.

Figure 12. Handing over briquette stoves to the Village Head and residents

Evaluation and mentoring

Evaluation related to the activities and process of making briquettes was carried out after training in making briquettes with the assistance of the committee and resource persons. Evaluation is given in the form of a questionnaire which is filled out directly by the participant. Based on the results of the questionnaire, it shows that 75% of the public do not know how to make briquettes and how to use them. Apart from that, the public also stated that they did not know that rice husks could be used as raw material for making briquettes. Rice husks are usually only used as a mixture in making planting media or in rice nurseries. The community was very enthusiastic about taking part in the training, this was shown by their participation in every stage of briquette making.

Mentoring activities are carried out within a week after the training is implemented. The implementation team in the field was asked to visit the participants' homes to collect important information regarding problems or difficulties in using the briquettes and briquette stoves that had been distributed. The mentoring model is carried out using the method of brainstorming various information for mutual development. There is a possibility that the assistance will provide re-education or refresh knowledge, especially for participants who wish to develop their briquette making business in terms of quantity and quality.

Outputs and Outcomes

The results of this training are knowledge about the use of raw materials derived from rice husk waste. So that raw materials originating from rice waste in the form of husks which are abundant in the surrounding area can be utilized optimally. Apart from that, the results of this training are in the form of briquettes resulting from the training carried out by the training participants. The expected result is that the community can understand well about the use of rice husk waste and that the community can properly use the briquettes that have been made.

Supporting and Inhibiting Factors for Activities

This community service activity shows success if changes occur in the process in building knowledge and skills in briquette making training. Several indicators of achievement of community service activities are as follows: (1) Attendance of all participants in learning reaches 100%; (2) Active participation of most participants by asking substantive and technical questions in the learning process; (3) Involvement in demonstration activities for processing rice husk briquettes as alternative energy; (4) Through field personnel, developments in the use of briquette stoves in each training participant's home will be seen; (5) Carrying out individual reviews or monitoring as well as mentoring approximately two weeks after the training.

Several supporting factors and obstacles experienced in implementing community service are as follows (1) Location and pattern of residence as supporting factors. Frequency meetings between residents and easy meeting between residents within an activity that supports the success of this community service activity. Although not directly, the closeness factor in society Malintang village has quite high levels of social capital, namely togetherness, mutual cooperation and awareness that is high enough to care about neighbor. This attitude is formed, among other things, from habituation factors carried out in women's organizations such as Dasa Wisma, PKK RT, and a community of mothers whose meeting intensity is quite high, so Tolerance and solidarity are trained in every moment together in one area, for example when there is a meeting of PKK women or monthly meeting of fathers in the RT area; (3) There is still a lot of time that fathers and mothers, even village youths, have to take part in empowerment activities, which is another supporting factor. Because positive activities can change the way of thinking from not doing activities other than being a housewife, farmer or unemployed to having positive activities, so that the substance of their conversation becomes more insightful; (4) The abundant availability of rice husks is not only found during the harvest season, this supports natural resources that can be utilized in making briquettes. So far, the use of rice husks has only been limited to making ash or planting medium for plants.

Apart from the supporting factors as described, there are also several inhibiting factors in this activity, including: (1) The weather factor, which currently frequently rains, causes the length of time for drying the briquettes to take longer. So the time for making briquettes takes longer ; (2) Inattentiveness in carrying out development independently is still quite high so that from the results of assistance only a few residents carry out briquette making independently. Although people have enjoyed the use of briquettes which can be used repeatedly in household activities.

Program Sustainability

Sustainability of the training program for making briquettes from husks can include testing the quality of the briquettes in a laboratory. Such as heat tests and proximate tests to determine the quality of the rice husk briquettes that have been made. So that it can be revised and improved on areas that are lacking, for example in the form of briquettes, the briquette material, the method of mixing the briquettes, the method of molding the briquettes in order to produce quality briquettes to be used as a commodity. Apart from that, assisted villages can also be established so that making briquettes can be used as an effort to improve the community's economy

D. Conclusion

Improving the quality of life through making rice husk briquettes as alternative energy which was held in the RT 01 Malintang Village area, Gambut District, especially for farmers, village youth and housewives, received a positive response. People who take part in briquette making training at the end of the training receive a briquette stove and briquette samples that can be used as a trial. Briquette stoves can also be used as an example of an alternative stove that can be used for the development of making briquette stoves independently. Making these briquettes does not require a large area of land, apart from that, the use of these briquettes is also very environmentally friendly so they are safe to use both on a household scale and for large-scale purposes. This training can be a medium for mutual learning, communication in order to increase insight and change the paradigm of thinking from doing nothing to being able to carry

out activities and even provide better services for the needs of a healthy environment for families.

Acknowledgment

Thank you to UIN Antasari Banjarmasin which has fully funded training and community service activities based on funding from the Litapdimas research grant in 2020.

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