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THE APPLICATION OF BIOMASS STOVES AMONG THE BERKAT RAMA FARMER GROUP IN BIBIOSI VILLAGE, ARSO DISTRICT, KEEROM REGENCY

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Abstract

This community service activity aims to introduce biomass stoves to communities in need, particularly those with abundant biomass waste. The biomass stove's performance has already been evaluated through prior research conducted on campus. This community service initiative will be carried out with the Berkat Rama farmer group in Bibiosi Village, a major corn production area near Cenderawasih University in Arso District, Keerom Regency. Based on preliminary site assessments, local farmers reported significant quantities of agricultural waste, specifically corn cobs, left after harvest. This waste has not been optimally utilized by farmers and is typically disposed of by burning. Motivated by this, our community service team from the Department of Mechanical Engineering at Cenderawasih University aims to introduce corn cob-fueled biomass stoves to the local community. The Community Service Program (PKM) was met with strong enthusiasm from participants, who actively engaged in the socialization session through to its conclusion. The community expressed a desire for more frequent activities of this kind to broaden their knowledge and skills, especially regarding appropriate technology applications. The final outcome of this community service is an increase in both knowledge and skills among members of the Berkat Rama farmer group, specifically in the fabrication and operation of the introduced biomass stoves. They also received training in operational safety for biomass stoves. The acquired knowledge and skills are expected to be applied and shared with other community members and farmers in the area.

Keywords: Agricultural Waste, Biomass Stove, Corn Cob, Farmer Group

INTRODUCTION

The Application of Science, Technology, and Arts (IPTEKS) represents a community service program developed by the Research and Community Service Institute (LPPM) of Cenderawasih University (UNCEN). This IPTEKS implementation program focuses on applying science, technology, and arts to enhance knowledge and skills while providing

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solutions to various issues within the community. The program is conducted through education, training, mentoring, and other public services. IPTEKS applications in the community may include theoretical studies or research findings relevant to the expertise of UNCEN faculty members. Target communities encompass a broad range of groups and institutions in both rural and urban areas.

To ensure the program's success, IPTEKS initiatives are conducted in collaboration with synergistic community partners, focusing on fostering community self-reliance. As a follow-up to the IPTEKS application program by UNCEN's LPPM, the Service Team from the Department of Mechanical Engineering will apply research findings on biomass stoves fueled by corn cobs, aiding local farmers in utilizing agricultural waste as an energy source for cooking.

Bibiosi Village, located in the Arso District of Keerom Regency, is a major corn production area near Cenderawasih University. Preliminary site assessments revealed substantial quantities of post-harvest agricultural waste, including corn stalks, husks, and cobs, that have not yet been optimally utilized by farmers. This waste is typically burned for disposal, which has motivated the Mechanical Engineering Service Team at Cenderawasih University to introduce corn cob-fueled biomass stoves to the local community.

Accordingly, the Community Service Team from UNCEN's Department of Mechanical Engineering will address this issue by introducing a biomass stove, whose performance has been verified through research conducted on campus. The biomass stove offers several advantages: it features a simple construction, is easy to operate, and can be self-built by farmers using locally available materials.

In addition to corn plant waste, the biomass stove can also use other types of biomass waste such as sawdust, dry leaves, and small branches. It is expected that using this biomass stove will lead to energy savings and add economic value for the farmers. Ultimately, the program aims to support energy self-sufficiency among farmers in the community service area.

IMPLEMENTATION METHOD

A. Duration and Target Community

This IPTEKS application program spans five months, from June to October 2024, covering various activities: initial outreach to the target farmer group, proposal drafting, preparation of tools and materials, biomass stove fabrication, socialization with the farmer group, final reporting, a results seminar, and publication in a community service journal. The target community consists of corn farmers within the Berkat Rama Farmer Group located in Bibiosi Village, Arso District, Keerom Regency.

B. Methodology

The approach to addressing the community's needs involves the design and implementation of a simple biomass stove, followed by introducing and socializing the tool with the corn farmers. The process includes:

1) An introduction to types of biomass waste and their benefits.

2) Explanation of the design and construction process for the biomass stove.
3) Detailing the required tools, materials, and budget necessary for constructing an appropriately sized biomass stove.
4) Instructions for operating the biomass stove, including work safety guidelines.
5) Encouraging the PKM participants to share the knowledge and skills acquired with other nearby farmers.

C. Biomass Stove Specifications

The introduced biomass stove, specifically designed for the Berkat Rama farmer group, is an output from research conducted in 2022.

Frame Specifications:

- Dimensions : 38 cm x 38 cm x 20 cm
- Material : 5 cm x 5 cm iron angle and Ø12 mm concrete iron
- Connection : Weld

Biomass Stove Specifications:

- Inner Diameter : 30 cm
- Outer Diameter : 38 cm
- Stove Height : 40 cm
- Air Vent : 10 cm x 5 cm
- Insulation Thickness : 4 cm
- Insulator Material : Lightweight concrete (silica sand, cement, limestone, gypsum, and aluminum powder)
- Inner Casing : Sheet metal from used paint buckets, 0.6 mm thick
- Outer Casing : Seng plat galvalum, tebal 0,3 mm
- Blower : Brushless 12V 2.85A model SHLF1209GHE-07

Figure 1. Biomass Stove with Blower (Construction and Specifications)

RESULTS AND DISCUSSION

A. Problem Resolution

This activity successfully addressed the issue on the ground by providing a prototype biomass stove. Previously neglected agricultural waste, such as post-harvest corn cobs and stalks, is now being recognized by farmers as a valuable fuel source for cooking and even as a potential feed processing material for pig farming.

Following the PKM (Community Service Program) activity, corn farmers, particularly those in the Berkat Rama Farmer Group, have gained an understanding of the fabrication process, operation, and safety techniques for using the biomass stove. Additionally, they have acquired skills and insights into appropriate technology, specifically in using corn cob and stalk waste as an alternative energy source. The knowledge and skills gained during the program can be shared with other farming groups in the Arso region of Keerom Regency (Figure 2).

Figure 2. PKM Activity Implementation through Biomass Stove Socialization

B. Activity Evaluation

The Community Service activity received a warm response and active participation from the corn farmers in the Berkat Rama Farmer Group, who remained engaged throughout the socialization session. Indicators of the program's successful implementation include the following:

1) All members of the Berkat Rama Farmer Group attended and actively participated in the biomass stove socialization activity.
2) Based on our observations, 80% of participants showed the ability and willingness to adopt and further develop the use of biomass stoves fueled by corn cobs and stalks.
3) All participants expressed satisfaction with the training/socialization session, with hopes for similar activities to be held in the future.
4) At the conclusion of the PKM, the farmers proposed that the local government provide funding assistance for procuring the tools and materials required to build biomass stoves.

CONCLUSION

The Community Service Program titled "Application of Biomass Stoves Among the Berkat Rama Farmer Group in Bibiosi Village, Arso District, Keerom Regency" has provided an innovative solution to address the abundance of post-harvest corn agricultural waste. The conclusions drawn are as follows:

1) PKM participants gained additional knowledge about the potential and utilization of various types of biomass waste as an energy source.
2) The biomass stove is an innovation for utilizing agricultural waste—such as corn stalks, husks, and cobs—as an alternative fuel source for cooking and preparing animal feed for the farmers in the PKM activity area.
3) PKM participants have developed skills in biomass stove fabrication and operation techniques, along with an understanding of safety practices during use.

It is recommended that socialization of appropriate technology tools for farmers, through Community Service activities like this, be conducted continuously in other corn production centers to support food and energy resilience in Papua.

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