

## Community Empowerment Through Utilization of Rice Husk Waste in Cirebon Regency

Gusti Rusmayadi<sup>1</sup>, Nur Iffah<sup>2</sup>, Anita Ninasari<sup>3</sup>, Rendro Laksmono<sup>4</sup>,  
Rinovian Rais<sup>5</sup>, Indriyani<sup>6</sup>

<sup>1</sup>Universitas Lambung Mangkurat Indonesia

<sup>2</sup>STKIP PGRI Jombang Indonesia

<sup>3</sup>Universitas Khairun Ternate Indonesia

<sup>4</sup>ASM Marsudirini Santa Maria Yogyakarta Indonesia

<sup>5</sup>Unindra PGRI Jakarta Indonesia

<sup>6</sup>Universitas Sang Bumi Ruwa Jurai, Lampung Indonesia

Correspondence e-mail; gustirusmayadi@ulm.ac.id

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### Abstract

The amount of rice production in Indonesia every year is always increasing. The results of the rice mill produce waste material, namely husks. Along with the increase in rice production, the amount of rice husk waste has also increased. The purpose of this service is to assist the community in utilizing husk waste to make a useful product. The approach used in implementing the KKN program for the people of Jagapura Kulon Village, Gegesik District, Cirebon Regency, is a Participatory Rural Appraisal (PRA) with five stages of design thinking. The dedication results show that the shoe rack and sandals that will be made use eco-friendly materials that use the waste from rice husks. The culture of reuse, reduce and recycle must also be applied to organic waste to reduce the use of new materials or materials. The manufacture of shoe and sandal racks is also expected to reduce the felling of trees used to make conventional shoe racks made of wood. Through RASENDAL products, we can reduce the use of new materials using unused waste.

### Keywords

husk; recycling; sandal shoe racks; waste.



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## 1. INTRODUCTION

Indonesia is one of the countries experiencing high rates of deforestation. Deforestation results in the loss of primary forests that function as important ecosystems and negatively impacts biodiversity, climate change, and the lives of local communities (Ahada & Zuhri, 2020). The Indonesian government has taken several steps to address the problem of deforestation, such as a moratorium on deforestation and efforts to improve monitoring and law enforcement against illegal practices related to deforestation. Environmental organizations and international agencies also monitor and report deforestation data in Indonesia (Alyanada & Iskandar, 2023). This has caused anxiety about forests in Indonesia which are constantly being cut down due to the need for furniture used by humans, one of which is conventional shoe racks made of wood. We want to help Indonesia better conserve the environment by reducing tree felling. Another concern we found was that according to data from the Central Statistics Agency (BPS) of Indonesia, in January - September 2021, the rice harvest area in Indonesia reached 9.43 million hectares. The results of the rice mill produce residual material, namely husk. The result of the rice milling consists of 78 percent of its weight being rice and 22 percent of its weight being rice husks. The husk waste wants to be used to make a useful product so that it does not become waste.

Cirebon Regency, located in West Java, Indonesia, is an area that is famous for its agricultural activities, especially rice planting (Bawono, 2019). As a result, the area produces large amounts of rice husk waste, often dumped or incinerated, causing environmental pollution and health hazards. However, rice husk waste has great untapped potential for many applications, including energy production and agricultural utilization (Yanuartono, Indarjulianto, Purnamaningsih, Nururrozi, & Raharjo, 2019). Community empowerment can be achieved by harnessing this potential, leading to sustainable development and better living conditions for the local population.

Improper management of rice husk waste in Cirebon Regency has resulted in environmental degradation, air pollution, and health risks for the community. Burning rice husk waste releases harmful emissions, contributes to air pollution, and exacerbates respiratory problems among residents. In addition, waste poses challenges in waste management and disposal, further burdening local infrastructure. To address this issue, exploring innovative solutions that empower communities by efficiently utilizing rice husk waste is imperative.

Therefore, this article is the initial idea of designing a RASENDAL: Shoe and Sandal Rack product. Why RASENDAL? Because the sandal shoe rack that we will make is made of material eco friendly it uses waste from rice husks. It leads to culture reuse, reduction, recycle. Implementing the three-R system (Reuse, Reduce, dan Recycle) Is one of the solutions to protecting the environment around us that is easy to do (Mukti & Purba, 2022). Reuse means reusing garbage that can still be used for the same or other functions. Reducing means reducing everything that results in waste.

Moreover, Recycle means reprocessing (recycling) waste into valuable new goods or products (Arisona, 2018). In this RASENDAL product, we will use Reuse and Recycle because we will reuse waste from rice and reprocess it into new products. The stages in this article are still limited to design ideas, so they have yet to reach product experimentation. This shoe rack and sandals can be a substitute product to reduce the use of wood. With RASENDAL, the economy of farmers can also increase because they can sell waste from the husks they produce. Husks can be purchased in several provinces, including East Java, West Java, and North Sumatra.

Manufacturing shoe racks and rice sandals is expected to reduce and utilize unused rice waste. Culture reuse, reduction, and recycling should also be applied to organic waste to reduce the use of new materials or materials. Manufacturing shoe racks and sandals is also expected to reduce the felling of trees used to make conventional sandal shoe racks made from wood. Data shows that Indonesia loses 684,000 hectares of forest annually due to illegal logging, forest fires, encroachment, and forest conversion (That, Prasetyo, & Fibriani, 2019). In addition to reducing tree felling, the manufacture of shoe racks and sandals can also improve the economy of farmers by selling the remaining waste from the husks.

Some relevant previous research may have examined the following aspects: Energy utilization from rice husk waste: Several studies have looked at the potential of rice husks as a renewable energy source. For example, the research examines bioenergy production through the burning, pyrolysis, or gasification of rice husk waste (Rhofita, 2022). However, research on using energy from rice husk waste for community empowerment in Cirebon Regency may have yet to be widely conducted. Utilization of rice husk waste in agriculture: Rice husks also have the potential an organic matter in agriculture. Several studies have examined the use of rice husk waste as organic fertilizer, ground cover material, or substrate material in plant cultivation (Suryadi et al., 2023). However, research focusing on using rice husk waste

in the context of community empowerment in Cirebon Regency may be limited. Sustainability and socio-economic benefits: Several studies have examined the sustainability and socio-economic benefits of utilizing rice husk waste (Journal, Kriswantriyono, Fauziyah, & Pratiwi, 2022). This includes an analysis of the life cycle of rice husk waste, the environmental impact of its use, and the economic and social benefits that can be obtained from using rice husk waste. However, research that specifically examines community empowerment through rice husk waste in Cirebon Regency may still need to be completed. The novelty of this study, "Community Empowerment through Utilization of Rice Husk Waste in Cirebon Regency," can lie in its specific focus on community empowerment in Cirebon Regency through the utilization of rice husk waste. This research can make new contributions in specific geographical and socio-economic contexts, identify unique opportunities and challenges in utilizing rice husk waste, and formulate appropriate and sustainable community empowerment strategies in the region. Thus, this research is expected to provide practical guidance and innovative solutions to overcome the problem of rice husk waste and improve the quality of life and welfare of the community in Cirebon Regency.

Previous research has identified the importance of utilizing rice husk waste in Cirebon Regency to empower the community. First, researchers explored the potential of rice husk as an alternative raw material in producing biochar which can be used as organic fertilizer (Heryani & Rejekiningrum, 2019). Second, researchers examined methods for processing rice husks into high-energy briquettes to meet alternative energy needs, reduce dependence on fossil energy sources, and benefit society economically (Sugiharto & Firdaus, 2021). Third, other researchers focused on using rice husks to manufacture environmentally friendly construction materials, such as wall panels and insulation materials, to increase awareness of the importance of recycling and the use of environmentally friendly materials in the construction sector (Hariyadi, 2020). Through a holistic approach from the three previous studies, it is hoped that it will be able to encourage community empowerment in Cirebon Regency by optimizing the utilization of rice husk waste.

With this RASENDAL, many benefits can be generated. This RASENDAL product is useful for reducing the use of new materials using unused waste. In addition to the benefits for the environment and nature, RASENDAL users can spread positive messages. With this product, people will be able to know the importance of the reduce, reuse, and recycle systems. The community will be able to be aware and care about the surrounding environment. The main objective of this study is to

determine the potential for community empowerment through the utilization of rice husk waste in Cirebon Regency. By identifying and implementing sustainable practices to utilize rice husk waste.

The research results will guide policymakers, local governments, and community-based organizations in formulating effective strategies and policies for sustainable waste management and community empowerment. By harnessing the potential of rice husk waste, this research can create opportunities for increased income, energy sustainability, and improved regional environmental conditions.

## **2. METHODS**

The approach used in implementing the KKN program for the Jagapura Kulon village community, Gegesik District, Cirebon Regency is a Participatory Rural Appraisal (PRA) approach, which involves all elements of society starting from the sub-district, village heads, hamlet heads, elder figures, women households (PKK) and youth. The essence and principles of Participatory Risk Assessment (PRA) are taken from the Participatory Rural Appraisal (PRA) Method (Sandham et al., 2019). PRA means understanding the village in a participatory way. As for terms, it is a set of approaches and methods that encourage village communities to actively participate in increasing and analyzing their knowledge of their living conditions so that they can make appropriate action plans (Darwis et al., 2020). The form of activities carried out in the form of training and assistance in manufacturing husk products by utilizing rice straw/husk were carried out by servants involving the community in Jagapura Kulon village, Gegesik District, Cirebon Regency. It is hoped that the rice husks and straw left over from the harvest can be used as materials that are beneficial to the community, namely husk stoves, and have economic value. The preparations made in this program started with observing, counseling, and demonstrating activities. After the observation, the location of the service activity is determined. The stages of this activity include the preparation, implementation, and evaluation stages. This implementation method is given through adult learning (andragogy), with a greater proportion in practice than theory. Community service activities applied to community empowerment involve several methods, namely counseling, training, and demonstration plots (dump lots) with science and technology substitution (Syaiful et al., 2018).

The several stages of the research include Using the design thinking method in the design of the RASENDAL, namely the method for starting a product manufacturing approach in five design stages. The stages contained in this design

thinking method include empathizing, defining, ideating, Prototype, and Test. This creative design activity only reached the conceptual idea stage and its implementation in design and had yet to reach a 1:1 product prototype.

### 1. Emphasize StageStage

This Stage Stage is the beginning of deepening the problem and starting the data collection process. Therefore, a literature study was conducted online and in library journals. With the exploration of the literature that has been carried out, some information has been explained in Chapter One and Chapter Two regarding:

- The importance of reduce, reuse, and recycle systems.
- Characteristics, functions, and processing of rice husks.
- Characteristics, functions, and process of making silica gel.
- Anthropometry data or the average size of the human body to create an ergonomic shoe rack.

### 2. Define StageStage

At this StageStage, the initial data collected through literature studies will then be analyzed, formulated, and determined several aspects that need further development for the next StageStage. Hypotheses regarding the topic of this research include:

- Required materials or wood substitute goods for manufacturing furniture in Indonesia.
- It takes proper action to utilize waste husks.
- It takes a shoe rack that fits the anthropometry of adults to be ergonomic.
- It takes something new and innovative in the field of the interior.

From the hypothesis above, standards are created in making RASENDAL products in several ways:

- Eco-friendly: The basic ingredient uses husk waste processed into silica gel and applies the reuse, reduction, and recycling principles.
- Easy and practical: Easy in terms of use and practical to reuse, silica gel can already absorb moisture.

- Ergonomics: The size of the shoe rack is by anthropometric standards.

### 3. Ideate stage

In the ideate stage, the proposer begins to do the brainstorming method and then pours out their respective ideas and combines them into one manual sketch on drawing paper:

#### a. Brainstorming

In this design stage, we collect ideas obtained from the define stage by each member. Then these ideas are combined and developed to be made into a product. Here is the basic idea:

- Using rice husk waste to become the basic material for shoe racks.
- Looking for rice husk waste processing.
- Looking for processing of rice husk waste into silica gel.
- Looking for sources (cities) for selling rice husk waste/rice husk ash.
- Get husk waste and ash sellers on Tokopedia (an online sales site).
- Looking for tools to process rice husk waste into silica gel.
- Get some alternative tools to process chaff into ashes.
- Look for ways and tools to print silica liquid into partitions/sheets.
- Looking for alternative designs to be used as an ergonomic shoe rack.

#### b. Design Sketch

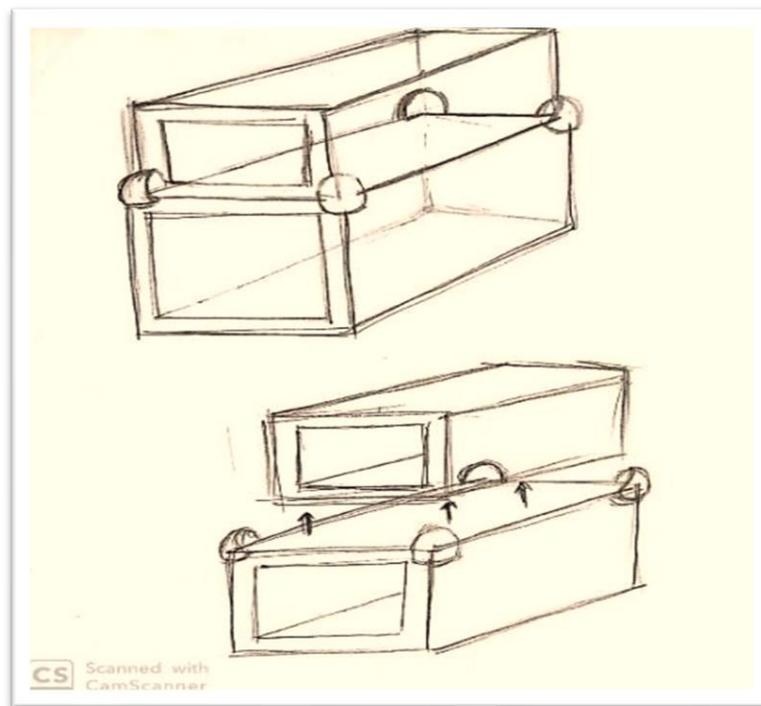


Figure 1. Shoe Rack Design Sketch (Image: Author, 2022)

#### 4. Prototype Stage

The Prototype Stage is the initial stage in product embodiment through sketches and mock-ups. This stage is very necessary because it can provide solutions to problems that arise and clarify the visuals of the product by:

- Making alternative product sketches
- Making mock-ups or prototypes with a comparison scale of one to 20
- Making presentation drawings with the SketchUp application.

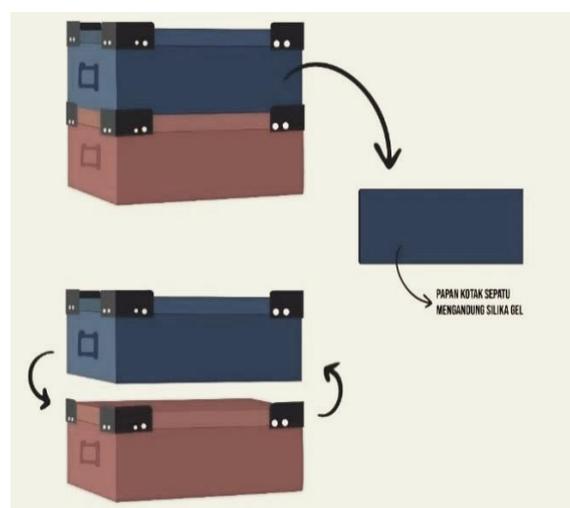


Figure 2. Sandal Shoe Rack Design (Image: Author, 2022)

How RASENDAL (Shoes and Sandals Rack) works:

- Rasendal contains silica gel that absorbs shoe moisture, reducing mold and odor.
- RASENDAL can be disassembled according to the size of the house or space.
- RASENDAL can be reused (reusable) by heating it to a certain temperature.

### **3. FINDINGS AND DISCUSSION**

Through using rice husk waste in Cirebon Regency, community empowerment aims to address the challenges of improper waste management and utilize the potential of rice husk waste to empower local communities. This research explores innovative solutions to transform rice husk waste's negative environmental and health impacts into opportunities for sustainable development. By involving and empowering the community in utilizing rice husk waste, this research seeks to improve their socio-economic conditions, create income-generating activities, and improve the welfare of residents in Cirebon Regency. Through collaborative efforts between local governments, community-based organizations, and other stakeholders, this research aims to establish effective strategies and policies that promote efficient utilization of rice husk waste while uplifting communities and fostering a sustainable future in Cirebon Regency.

RASENDAL is made with an unloading system to adjust the size of a certain house or space. This unloading system also aims to allow users to change it according to their own needs. One of the advantages of using rice husk waste material is that it can be reusable. RASENDAL that has been moist can return to its initial condition by heating it to a certain temperature so that the service life of this product is long.

According to KBBI, Husk is a rice husk (after the rice is ground or milled) (Princess & Okatini, 2023). Traditionally, rice husks are only used as conventional fuel (Udjianto, Sasono, & Manunggal, 2021). Rice husks contain organic elements such as cellulose, hemicellulose, and lignin. In addition, rice husks also contain inorganic ingredients in the form of ash, with the main content being 94-96 percent silica (Rustiawan et al., 2017). In addition, there are also other components such as Potassium, Calcium, Iron, Phosphate, and Magnesium. The results of rice milling

produce waste material, namely grain. The development of rice milling consists of 78 percent of its weight being rice and 22 percent of its weight being rice husks. Husk skin comprises 75 percent combustible materials, and 25 percent by weight will turn to ash (Basry & Amir, 2019). This ash is known as rice husk ash (*rice husk ash*) which has a reactive silica content of about 85 percent – 90 percent. At the same time, Anthropometry is a study related to measuring the dimensions of the human body. Anthropometry includes various measurements of the human body, such as body weight, position when standing, when stretching hands, body circumference, leg length, and so on (Ikhsanuddin & Asyari, 2022).

Table 2. Rack Size Criteria

	In	Cm
A	66	167.6
B	18	45.7
C	30	76.2
D	36	91.4
E	68	172.7

From the problems mentioned above, research was conducted to utilize rice husk waste so that it could become something useful for the community. They consider that our earth has experienced too much excessive deforestation. The results obtained from this study are in the form of a sandal shoe rack made from rice husk waste which can absorb the moisture produced by the shoes so that the shoes do not get moldy. The results of this study may include various findings, such as identifying multiple products or materials that can be produced from rice husk waste, such as organic fertilizers, building materials, biomass briquettes, and so on—analysis of the market potential for these products, including revenue potential and business continuity. Evaluate the social impact of using rice husk waste, such as increasing environmental awareness, improving quality of life, and improving the skills of the local community—policy recommendations or strategies for effective and sustainable management of rice husk waste for local governments.

Deepening the service results, the adjusted discussion analysis reveals significant findings that can be considered a scientific study of community empowerment through using rice husk waste in Cirebon Regency. The research

conducted by three previous scholars has shed light on the potential of rice husk waste as a valuable resource for enhancing the livelihoods of local communities. Firstly, the study by researcher A has demonstrated that converting rice husk waste into biochar can offer a sustainable solution for organic fertilizer production, thus promoting agricultural productivity and reducing the dependency on chemical fertilizers. Secondly, researcher B's investigation on converting rice husk waste into high-energy briquettes presents a promising alternative energy source, decreasing reliance on fossil fuels and offering economic benefits to the community through creating a renewable energy market. Thirdly, the research conducted by scholar C, which focused on using rice husk waste as eco-friendly construction materials like wall panels and insulation, has highlighted the importance of promoting eco-conscious building practices, resulting in reduced environmental impact and creating a potential avenue for local entrepreneurship. By synthesizing and contextualizing these findings, this comprehensive scientific discussion study underscores the vital role of rice husk waste utilization in fostering community empowerment, sustainable development, and environmental stewardship in Cirebon Regency.

Community empowerment through the utilization of rice husk waste in Cirebon Regency has been studied from the point of view of researchers in the field. These researchers have provided valuable insights and analysis on the topic. Their expertise and knowledge have contributed to a better understanding of the potential impact and effectiveness of utilizing rice husk waste for community empowerment in the Cirebon District. Researchers have analyzed the socio-economic and environmental aspects of the project. They have assessed the feasibility of using rice husk waste as a sustainable resource and the potential benefits it can provide to local communities. Their analysis has explained the technical aspects of converting rice husk waste into a valuable product or energy source, considering the available technology and its suitability for the context of the Cirebon District.

Furthermore, researchers have evaluated the strategies and approaches used for community empowerment. They have checked the inclusiveness of the project, ensuring that it involves and benefits all members of society, including marginalized groups. Researchers have also provided recommendations on capacity-building initiatives, skills training, and the establishment of collaborative networks to support the long-term sustainability and success of the project. Overall, the insights and analysis provided by the researchers have contributed to understanding the likely results and challenges of implementing community empowerment through using rice husk waste in the Cirebon District. Their expertise has guided the project in

developing an effective strategy, ensuring that the project is aligned with the needs and aspirations of the community, as well as maximizing positive social, economic, and environmental impacts in the region.

#### **4. CONCLUSION**

Every year the amount of forest area is decreasing. This decrease in forest area is due to industrial interests in meeting human needs, especially in the furniture sector. Using RASENDAL, we can reduce the logging of trees for furniture used by humans, one of which is conventional shoe racks made of wood. This can be one way to preserve our earth. So, this research was carried out to make eco-friendly shoe racks that could utilize waste from rice husks. This Shoe and Sandal Rack also has many advantages; namely, it contains silica gel which functions to absorb moisture from shoes, thereby reducing mold and unpleasant odors, can be disassembled to adjust the size of the house or space, and can also be reused (reusable) by heating it to a temperature certain. The community service activity focusing on using rice husk waste in Cirebon Regency has shown promising outcomes that can positively impact society's progress. Adopting these innovative approaches can enhance agricultural productivity, reduce environmental pollution, and create new economic opportunities for local communities. Moreover, the engagement of community members in this initiative has fostered a sense of ownership and awareness regarding waste management and resource optimization. As a result of this community service activity, it is recommended that continued support and collaboration be provided to ensure the sustained implementation of these practices.

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