



Journal home page: <http://ajarcde-safe-network.org> ISSN 2581-0405

Empowerment of Farmer Groups through the Utilization of Rice Husk Waste into Environmentally Friendly Particleboard in Cepoko Village, Jombang Regency

Risqi Firdaus Setiawan¹, Nisa Hafid Idhoh Fitriana² and Ika Sari Tondang³.

^{1,2,3} Agribusiness Study Program, Faculty of Agriculture, Universitas Pembangunan Nasional Veteran Jawa Timur, Surabaya, Indonesia,

ARTICLE INFO

Article History:

Received: 23 July 2025

Final Revision: 07 August 2025

Accepted: 19 August 2025

Online Publication: 22 August 2025

KEYWORDS

Enablement, Rice Husks, Particleboard, Agricultural Waste

CORRESPONDING AUTHOR

*E-mail: risqi.fagribis@upnjatim.ac.id

ABSTRACT

Cepoko Village, Jombang Regency, is one of the rice production centers that produces large amounts of husk waste. So far, the waste has been burned or discarded, causing environmental problems and failing to provide added value to the community. This service activity aims to empower farmer groups by utilising rice husk waste to produce environmentally friendly board particles. The methods used include problem identification, technical training, production assistance, and participatory evaluation. The production process involves shredding the husk, mixing adhesive materials, pressing, and drying. The results of the activity demonstrate an increase in the community's understanding and technical skills in converting waste into products of economic value. The resulting board particles have the potential to be developed as alternative building materials. This program also has an impact on the growth of environmental awareness and the opening of local resource-based business opportunities. This activity proves that appropriate technological approaches combined with participatory empowerment can encourage socio-economic transformation at the village level.

Contribution to Sustainable Development Goals (SDGs):

SDG 8: Decent jobs and economic growth

SDG 11: Sustainable cities and settlements

1. INTRODUCTION

1.1. Research Background

Cepoko Village in Jombang Regency is one of the rice farming center areas whose production activities take place intensively throughout the planting season. Harvesting activities produce large amounts of agricultural residues, one of which is rice husks. However, this waste is still seen as a waste material with no use value, so it is generally only burned or thrown away carelessly by the community. Such practices not only reflect a lack of awareness of the importance of waste management but also demonstrate the lack of integration between agricultural practices and environmental sustainability principles [1]. This is an early indication of ecological and social problems that need to be addressed systematically, especially in the context of achieving

SDG 11, namely building inclusive, safe, resilient, and sustainable cities and settlements.

Burning rice husks in an open environment produces air pollution that has the potential to interfere with public health, while discharge into waterways causes damage to the aquatic environment [2]. This problem is protracted due to the lack of easily accessible and relevant management alternatives that are relevant to the village community's conditions. Rice husks have the potential to be an alternative raw material for biomass-based products such as board particles. The lack of understanding of this potential reinforces the view that agricultural waste has no economic value [3]. Thus, the problem of waste management in Cepoko Village is not only a technical issue, but also related to the knowledge, habits, and attitudes of the community towards waste.

From a socio-economic perspective, the people of Cepoko Village face limitations in diversifying their income sources.



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

Published under licence by SAFE-Network

Dependence on key crops without the development of local resource-based businesses has stagnated in their welfare levels. Rice husk waste can be an alternative to new companies that add value and have the potential to create local jobs [4]. This empowerment-based waste treatment initiative is relevant to SDG 8, which aims to encourage inclusive and sustainable economic growth and provide decent jobs for rural communities. However, low entrepreneurial literacy and a lack of institutional support hinder the optimal exploitation of this opportunity. This is where the importance of community empowerment-based interventions lies in opening access to innovations that are both applicable and adaptive to village conditions [5].

The next problem lies in the limited access to appropriate technology that supports the waste treatment process. The lack of basic tools like choppers and presses prevents people from processing rice husks independently. The absence of technical training, business assistance, and good practice models in waste management is a serious challenge that hinders environment-based social transformation [6]. In addition, the institutional aspect of the village community is not strong enough to encourage collective initiatives in building waste-based businesses. Therefore, community capacity building efforts are an urgent thing to do.

1.2. Literature Review

1.2.1. Farmer Empowerment

Farmer empowerment is a process of increasing the capacity of individuals and farmer groups in managing agricultural resources more independently, productively, and sustainably. This process involves aspects of education, technical training, increased access to technology, and strengthening social and economic institutions [7]. An effective empowerment approach is participatory, where farmers are not only beneficiaries, but also actively involved in program planning and implementation. Research shows that active participation of farmers in training and mentoring activities can increase business independence, adaptability to change, and strengthen social networks between farmers. Therefore, the empowerment of farmers cannot be separated from the role of companions, local institutions, and synergies between sectors that strengthen each other in encouraging social and economic transformation in rural areas.

1.2.2. Utilization of Rice Husk Waste

Rice husks are a significant agricultural waste that is often not optimally utilized by rural communities [8]. The practice of incinerating or disposing of husks remains a common problem that significantly impacts environmental pollution. Rice husks have silica content and physical properties that allow them to be processed into various products of economic value, such as briquettes, compost, and alternative building materials such as board particles. Multiple studies have shown that rice husk-based board particles have adequate mechanical strength and can be produced with simple technology suitable for village-scale production. The use of this waste also opens up opportunities for the development of new businesses based on local raw materials that are cheap and easy to obtain. However, its use requires technical training support, production assistance, and access to appropriate processing tools so that the community can process it independently and sustainably [9].

1.3. Research Objective

Community service activities are directed to intervene in the knowledge, technology, and institutional aspects simultaneously. The participatory approach is expected to increase the active involvement of farmer groups in every stage of the program, from problem identification to the implementation of solutions. Capacity building through waste treatment training, business group formation, and environmental education is a key strategy to encourage transformation towards sustainable villages [10]. Through this activity, the community is expected not only to acquire technical skills but also to raise awareness of the importance of managing local resources in a productive and environmentally friendly manner. Thus, this service is part of a collaborative effort in realizing independent, inclusive, and environmentally sound village development as directed in the SDGs 8 and SDGs 11.

2. MATERIALS AND METHODS

This community service program is carried out through several systematic stages. The stages carried out in this activity are as follows:

2.1. Preparation Stage

The initial stages of the activity began with the identification of problems in Cepoko Village, especially related to the management of rice husk waste that has not been utilized optimally. The service team conducted field observations and discussions with the Cepoko Farmers Group to gather information about waste management habits, local potential, and obstacles faced by the community in utilizing agricultural waste. The results of these observations became the basis for preparing service activity plans and training materials, including the introduction of technology for processing rice husk waste into particle boards. The team also prepared activity support devices, such as training modules, teaching aids, and field practice materials.

2.2. Implementation Stage

The implementation stage began with counseling activities to the community and the Cepoko Farmers Group regarding the importance of circular economy-based agricultural waste management. The activity continued with technical training on the process of making particle boards, starting from shredding husks, mixing materials, pressing, and drying. In addition to technical training, direct assistance is also carried out in the field, which aims to ensure that the community can understand and master the production process independently. The implementation of the activity also included a Focus Group Discussion (FGD) involving the fathers of the Cepoko Village farmer group. The simulation method is applied in the practice of particle board production so that participants can directly apply the skills acquired.

2.3. Evaluation Stage

Evaluations are conducted to measure the success of the program based on participant involvement, understanding of the material, and practical skills. Evaluation was carried out through questionnaire methods, field observations, and interviews with participants. The aspects evaluated include changes in

knowledge, attitudes, and skills in waste management into products of economic value. At the end of the activity, participants were encouraged to prepare a follow-up plan independently to maintain the sustainability of the program. The service team also conducts short-term monitoring after the activity to ensure that the community can continue to implement the technology taught sustainably.

3. RESULT AND DISCUSSION

3.1. Observation of Rice Husk Waste Problems in Cepoko Village, Jombang Regency

The results of initial observations conducted by a team of Agribusiness lecturers from the Faculty of Agriculture UPN Veteran East Java in Cepoko Village show that the problem of rice husk waste is a sustainable issue and has a multidimensional impact. Local communities, who largely depend on the rice farming sector for their livelihoods, produce large amounts of husk waste after harvest time. The husks are generally burned in the open or dumped into rivers, as they are considered useless waste. This practice shows that there is no systemic approach to agricultural waste management at the community level. According to [11], the open burning of agricultural waste contributes significantly to air pollution and increases the risk of respiratory distress for surrounding communities.

From the results of interviews with members of the Cepoko Farmers Group, it was identified that the burning was carried out due to limited information and the absence of practical and easily accessible alternatives. The community lacks sufficient knowledge about the economic potential of rice husk waste, including its use as a raw material for particle boards, briquettes, or planting media. [12] stated that limited knowledge and access to technology are the main obstacles in the management of rice husk waste in rural areas, even though this waste has the potential to be developed into alternative energy and building materials. This condition indicates a gap between the potential of local resources and the community's capacity to manage them.

From an ecological and health perspective, the continuous burning of rice husks has had a real negative impact. Smoke from combustion causes air pollution that is detrimental to the community, especially vulnerable groups such as children and older people. In addition, the discharge of sewage into waterways risks creating blockages, exacerbating seasonal flooding and contaminating water sources. [13] suggests that improperly handled rice husk waste will have a domino effect on environmental quality and public health. This situation underscores the urgent need for education and technological intervention in targeted waste management.

The observation also noted that the public's perception of waste remains negative and stagnant. People generally do not realize that agricultural waste, especially rice husks, can be converted into environmentally friendly products that have high commercial value. According to [14], the silica and fiber content in rice husks makes it a very promising material to be developed into alternative material products such as composite boards and insulation materials. The low literacy of innovation at the village level is one of the main challenges in implementing a community-based circular economy approach.

Thus, the results of field observations show that the problem of rice husk waste management in Cepoko Village is not only

related to technical aspects, but also includes educational, social, and structural dimensions. This service activity is designed to answer these problems through an empowerment approach that combines environmental education, technical training, and institutional assistance. This participation-based intervention is expected to change the societal paradigm from viewing waste as mere residue to recognising it as potential. As explained by [15], the active participation of the community in the management of local resources is the key to the success of sustainable programs at the village level.

3.2. Assistance in the Management of Rice Husk Waste into Particulate Matter Board

The assistance activity for the management of rice husk waste into particle boards was carried out as a follow-up stage of the technical training that had previously been carried out to the Cepoko Farmers Group. The main goal of this assistance is to ensure that the community not only gains theoretical understanding, but is also able to implement the entire production process independently and sustainably. During the activity, the community was accompanied in the implementation of direct practice in the field, with demonstration methods and technical guidance in stages. This strategy is chosen to ensure that each stage of production is carried out correctly and according to the set standards.



Figure 1. East Java Veteran UPN Service Team with Cepoko Village Farmer Group, Jombang Regency

The production process of particle board accompanied in this activity involves several main stages, namely: (1) Preparation Stage of Tools and Raw Materials, where rice husk waste is collected and sorted to ensure that it is not mixed with foreign materials. (2) Production Stage, which is the shredding of husks using a chopper machine until it is small and uniform. (3) Mixing Stage, where the chopped husks are mixed with adhesives (environmentally friendly glue or resin) until homogeneous. (4) Pressing stage, which is the process of pressing the mixture of materials into the mold using a manual press to form a solid sheet. (5) Drying stage, which is carried out in direct sunlight or a simple oven, until the board particles harden and are ready for use. This process has been adapted to appropriate technology that is easy to operate by the village community, without the need for complex industrial machinery.

In this assistance, the service team ensures that each group member understands the basic principles of the processing process, starting from the physical characteristics of rice husks to mixing and pressing techniques. A participatory approach is applied so that the community is not only the object of training,

but also active actors in the entire production process. As stated by [16], improving people's technical skills through hands-on experience will accelerate the process of adopting local technologies and increase their sense of ownership of such innovations. In addition, this assistance also provides education on the importance of maintaining production quality so that products are competitive in local and regional markets.



Figure 2. Presentation of Material on Processing Rice Husk Waste into Environmentally Friendly Board Particles



Figure 3. Product Results of Particleboard from Rice husk

The mentoring activities also identified several field challenges that need to be considered for the sustainability of this business, such as the variety of production results, dependence on the weather in the drying process, and technical capabilities in mixing materials. Therefore, the service team not only focuses on the production aspect, but also provides briefings related to production management, result recording, and quality control. According to [17], the success of waste-based businesses is highly determined by the consistency of product quality and the efficiency of the production process carried out by the processing community.

In general, this assistance has succeeded in increasing technical capacity and public awareness of the importance of waste management productively and sustainably. The resulting particle board products have gone through simple tests related to strength and durability, and are projected for further development as an alternative material in the manufacture of furniture or home partitions. By utilizing agricultural waste as raw materials, this program not only solves environmental problems, but also opens up new economic opportunities for rural communities. This is in line with the findings [18], which state that applicable training and mentoring can encourage social transformation through the use of waste into value-added products.

4. CONCLUSION

The service activity carried out in Cepoko Village succeeded in empowering farmer groups through the use of rice husk waste into environmentally friendly board particles. The main problems faced by the community, namely waste burning and low utilization of rice husks, are overcome through an appropriate technology-based training and mentoring approach. The production process of particle board, involving shredding, mixing adhesives, pressing, and drying, has been gradually mastered by the community. As a result, there has been an increase in technical skills, environmental awareness, and the emergence of new local waste-based business potential. This program demonstrates that collaboration between academics and the community can foster the development of adaptive circular economy practices at the village level.

The sustainability of the rice husk waste management program into particle boards requires a long-term commitment through strengthening production aspects, product quality, and marketing strategies. The active involvement of village governments, relevant agencies, and universities is indispensable to ensure the availability of facility support, advanced training, and market access. Similar initiatives also have the potential to be implemented in other regions that have similar agricultural characteristics, so that the benefits of innovation can be felt more widely. Enhancing farmers' technology literacy and business management skills is crucial, as it will empower them to engage in independent and sustainable village economic activities.

REFERENCE

- [1]. Andriani, G. A., Marina, I., & Sumantri, K. (2022). Respon petani terhadap pemanfaatan limbah sekam padi menjadi briket di Desa Karangsambung Kecamatan Kadipaten Kabupaten Majalengka. *Journal of Sustainable Agribusiness*, 1(1), 8–13. <https://doi.org/10.31949/jsa.v1i1.2760>
- [2]. Asfar, A. M. I. A., Asfar, A. M. I. T., Thaha, S., Kurnia, A., Nurannisa, A., Ekawati, V. E., & Dewi, S. S. (2021). Hiasan dinding estetika dari limbah sekam padi. *Batara Wisnu: Indonesian Journal of Community Services*, 1(3), 249–259. <https://doi.org/10.53363/bw.v1i3.25>
- [3]. Betaubun, M., Poerwandar, A., & Tjilen, A. P. (2022). Pelatihan pemanfaatan limbah sekam padi pada siswa SMA Eunterpreneurship Chevalier Anasai Merauke. *ADMA: Jurnal Pengabdian dan Pemberdayaan Masyarakat*, 2(2), 255–264. <https://doi.org/10.30812/adma.v2i2.1523>
- [4]. Dulkiah, M., et al. (2023). Community participation forms in Indonesian villages to support the sustainable development goals program. *Journal of Law and Sustainable Development*, 11(11). <https://doi.org/10.55908/sdgs.v11i11.2061>
- [5]. Ervil, R., & Muslimin, U. (2017). Percobaan pembuatan partikel board dengan menggunakan limbah pengolahan kulit kayu manis. *Jurnal Sains dan Teknologi*, 17(2), 49–56. <https://doi.org/10.36275/stsp.v17i2.26>
- [6]. Hasmita, I., Mistar, E., Mauliza, N., & M., M. (2025). Processing rice husk waste into charcoal as a plant growing medium and organic fertilizer. *WISDOM: Jurnal Pengabdian Kepada Masyarakat Wisdom*. <https://doi.org/10.71275/wisdom.v2i1.54>
- [7]. Hossain, S., Roy, P., & Bae, C. (2021). Utilization of waste rice husk ash for sustainable geopolymer: A review. *Construction and Building Materials*. <https://doi.org/10.1016/j.conbuildmat.2021.125218>

- [8]. Jaya, A., Alfandy, V., & Sumarno, W. (2023). Increasing the skills of Kadilajo village residents in the processing of rice waste into briquette as an effort to realize economic independent villages. *Jurnal Bina Desa*, 4(3). <https://doi.org/10.15294/jbd.v4i3.38803>
- [9]. Listiana, I., Bursan, R., Widyastuti, R. A. D., Rahmat, A., & Jimad, H. (2021). Pemanfaatan limbah sekam padi dalam pembuatan arang sekam di Pekon Bulurejo, Kecamatan Gadingrejo, Kabupaten Pringsewu. *Intervensi Komunitas*, 3(1), 1–5. <https://doi.org/10.32546/ik.v3i1.1118>
- [10]. Mahmudati, R., et al. (2024). Briket sekam padi sebagai energi alternatif di Desa Bandingan, Bawang Banjarnegara. *SOROT: Jurnal Pengabdian Kepada Masyarakat*, 3(1). <https://doi.org/10.32699/sorot.v3i1.6634>
- [11]. Maasi, J. (2025). Empowering millennial farmers to enhance the competitiveness of local commodities through digital technology. *International Journal for Science Review*. <https://doi.org/10.71364/ijfsr.v2i4.36>
- [12]. Matin, H., et al. (2023). Rice husk waste: Impact on environmental health and potential as biogas. *Jurnal Kesehatan Masyarakat*, 18(3). <https://doi.org/10.15294/kemas.v18i3.42467>
- [13]. Meirezaldi, O., Worokinasih, S., Fahrudi, A., Prafitri, R., Hapsari, A., Anam, A., Karimah, A., Margaretha, E., Putri, H., Sazkiya, L., Panjaitan, N., Muhana, N., Fadhlila, N., Achmadinata, R., Ali, S., Wahyuni, T., & Awilia, Z. (2025). Strategi pengelolaan sampah rumah tangga berbasis komunitas di Desa Sambirejo, Kabupaten Pasuruan. *Abdimas Indonesian Journal*. <https://doi.org/10.59525/aij.v5i1.621>
- [14]. Oyedeji, S., Patel, N., Krishnamurthy, R., & Fatoba, P. (2024). Agricultural wastes to value-added products: Economic and environmental perspectives for waste conversion. *Advances in Biochemical Engineering/Biotechnology*. https://doi.org/10.1007/10_2024_274
- [15]. Rubini, R., Meirani, N., & Adila, L. (2024). Pendampingan pengelolaan limbah organik untuk meningkatkan produktivitas pertanian ramah lingkungan di Jayan Canden Jetis Bantul Yogyakarta. *MUJAHADA: Jurnal Pengabdian Masyarakat*. <https://doi.org/10.54396/mjd.v2i2.1690>
- [16]. Rusmayadi, G., et al. (2023). Community empowerment through utilization of rice husk waste in Cirebon Regency. *Amalee: Indonesian Journal of Community Research and Engagement*, 4(2). <https://doi.org/10.37680/amalee.v4i2.3012>
- [17]. Satbaev, B., et al. (2021). Rice husk research: From environmental pollutant to a promising source of organo-mineral raw materials. *Materials*, 14(15), 4119. <https://doi.org/10.3390/ma14154119>
- [18]. Syafri, E., Kurniawan, R., Layyin, H., Khoiriah, S., & Sanusi, A. (2025). Sosialisasi pemberdayaan kewirausahaan berbasis digital untuk meningkatkan kesejahteraan ekonomi masyarakat RW 008, RW 017 dan RW 018 Perumahan Benda Baru, Pamulang – Tangerang Selatan. *Aksi Nyata: Jurnal Pengabdian Sosial dan Kemanusiaan*. <https://doi.org/10.62383/aksinyata.v2i2.1161>