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Enhancing Digital Entrepreneurship of the Kampung Durian Community through Ecopreneurship Training based on Artificial Intelligence in Pakis Village, Jember

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ABSTRACT

Background: The Pakis village is known as the Durian Village which has abundant durian farming potential. However, the low skills of the community in product processing and digital marketing have not provided economic value.
Contribution: This community service activity aims to enhance the digital entrepreneurship skills of the community through ecopreneurship based on Artificial Intelligence (AI).
Method: This research used a descriptive qualitative approach combined with the Participatory Action Research (PAR) method with 20 purposively selected participants. Data were collected through pre- and post-tests, observations, focus group discussions, and interviews, and analyzed using thematic analysis supported by descriptive statistics.
Results: Ecopreneurship training based on artificial intelligence significantly enhanced participants' digital entrepreneurship with pre-test score 41.2 and post-test score 88.1 with an improvement of 113.9%.
Conclusion: The findings highlight the novelty of participatory integration between ecopreneurship and AI in rural contexts, offering both theoretical contributions to the literature on sustainable digital entrepreneurship and practical insights for policy. This model has potential for replication in other rural communities in Southeast Asia, supporting global discourses on the circular economy, digital inclusion, and the Sustainable Development Goals (SDGs).

1. Introduction

Pakis village is one of the villages located in the Panti District, Jember Regency, situated on the slopes of the Argopuro Mountains with its main commodity being durian trees, thus known as the durian tourism village [1]. Pakis village is one of the villages in the Panti sub-district that has been designated as a development village by the University Jember based on SK Number 4242/UN25/KL/2022. Pakis village has an area of 2,697 km² with agriculture as its main commodity, so most of the livelihoods of the people in Pakis village depend on nature [2]. The population of Pakis village is 5,819 people, with 4,432 people or 76.16% recorded as poor with limited and uncertain incomes [3], even though Pakis village has the highly potential natural commodity of durian to be developed. However, the utilization of durian in this village is still conventional, where most of the fruit is sold fresh without further processing, leading to dependence on the harvest season and market price fluctuations [4], [5]. In addition, durian waste such as peels and seeds are often disposed of carelessly causing environmental problems that have not been optimally addressed in Figure 1.

Figure 1. Team interview with the head of village, community, and observation of the village environment

The ecopreneurship approach which combines entrepreneurship with environmental sustainability principles can be an effective solution for sustainably developing local potential. Ecopreneurship is a concept of entrepreneurship that prioritizes sustainability principles by wisely utilizing natural resources and considering environmental impacts in every business process [4]–[7]. Ecopreneurship not only emphasizes the entrepreneurial aspect but also instills environmentally friendly values in the production and distribution processes of products [8], [9]. Ecopreneurship training aims to process durian waste into value-added products such as briquettes [10], biopesticides [11], adsorbents [12] macaroni [13], and durian seed milk [14].

On the other hand, ecopreneurship has weaknesses such as limited access to markets and digital marketing, making it difficult to reach a broader consumer base [15] and a lack of innovation in product diversification that aligns with market trends due to limitations in research and data analysis [16]. These constraints hinder rural entrepreneurs from reaching broader markets and adapting to consumer demands. Therefore, the integration of ecopreneurship with Artificial Intelligence (AI) becomes an innovative solution in enhancing the effectiveness of digital marketing, product packaging design, and product innovation development in ecopreneurship based businesses. In the current technological era, artificial intelligence (AI) provides significant opportunities to help rural communities overcome digital limitations [17]. Artificial intelligence can make it easier for the community to create promotional content and marketing narratives even without high technical skills [18]. AI such as Canva AI, Copy.ai, and ChatGPT enable the creation of visual designs, social media

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captions, and promotional articles quickly and effectively. AI such as Google Trends and ChatGPT play a role in identifying consumer needs and generating more innovative product diversification ideas that align with market demand.

Empowerment of the Pakis village community in managing durian waste has been carried out, but the training model has not been implemented in an integrated manner that comprehensively combines ecopreneurship and AI for community empowerment. Similar studies in rural Indonesian Communities highlighted the potential of digital platforms for empowering smallholder farmers but did not address sustainable waste management[18]. This activity aims to organize ecopreneurship based on AI tailored to the social, economic, and cultural characteristics of the Pakis Village community. This training is expected to enhance the residents' ability to process durian waste into creative economic products and master AI-based digital marketing techniques. The uniqueness of this training lies in the integration of ecopreneurship principles and artificial intelligence technology within a participatory training scheme, which is expected to raise environmental awareness, strengthen the local economy, and create sustainable job opportunities. The urgency of this research lies in addressing poverty, environmental waste, and the digital divide in rural areas. Its contribution is expanding the discourse on AI-supported ecopreneurship in rural settings; and practically, by offering a replicable model of sustainable community empowerment that fosters environmental awareness, strengthens the local economy, and generates inclusive employment opportunities.

2. Method

This research uses a descriptive qualitative approach combined with the Participatory Action Research (PAR) method, a collaborative and participatory approach that allows for active community involvement in the process of social change [19] This approach was chosen because it aims not only to deeply understand the phenomenon but also to create contextual solutions together with the residents of Pakis Village, particularly in the development of ecopreneurship based AI as an effort to utilize durian waste. The implementation of this research followed five main stages of the Participatory Action Research (PAR) cycle [20], [21]. The first stage, problem identification was conducted through field observations and informal interviews with community leaders to uncover the main issues related to durian waste management, low environmental awareness, and limited digital literacy. The second stage, action planning involved preparing training modules that introduced the basics of Artificial Intelligence, principles of ecopreneurship [22], [23], techniques for processing durian waste into economically valuable products, and AI-based digital marketing strategies. The third stage, implementation of actions was realized through interactive workshops, hands-on practice, and mentoring sessions designed to enhance participants' technical and entrepreneurial capacities in a contextual manner. The fourth stage, observation required the researchers to carefully examine participants' levels of engagement, responses, and learning processes during the training activities using participatory observation techniques. Finally, the fifth stage, reflection was conducted through participatory evaluation with the community to assess the effectiveness of the training, identify challenges faced, and formulate strategies for continuous improvement [24].

A total of 20 participants were selected through purposive sampling based on their interest in developing durian-based products, availability during the training, and prior involvement

in community-based economic activities. The sample was men and women with a majority of participants being small-scale farmers and housewives engaged in local agricultural production. Data collection was conducted through direct observation, semi-structured interviews, Focus Group Discussions (FGD), and activity documentation. The validity of the data is ensured through source and method triangulation techniques in Figure 2. Data analysis was conducted using a thematic analysis approach to extract key themes such as citizen participation, technology adoption, knowledge transformation, and the socio-economic-environmental impact of the training.

The effectiveness of the intervention program is measured through pre-tests and post-tests on participants to determine the improvement in their understanding of the training material. This research was conducted with attention to research ethics, such as obtaining voluntary informed consent and ensuring the confidentiality of participants' data. Instruments such as interview guides and evaluation sheets were tested beforehand to ensure their clarity and effectiveness. All participants provided written informed consent, were assured of confidentiality, and had the right to withdraw from the study at any stage. With a systematic, participatory, and ethical methodological approach, this research is expected to make a significant contribution to strengthening technology-based sustainable entrepreneurship in rural areas with local potential.

3. Results and Discussion

This training activity was attended by 20 selected participants from the village of Pakis who have an interest in developing durian processing businesses and digital marketing in Figure 2. The training was conducted over three consecutive days, from 14 June to 16 June 2025 at the local village hall. On the first day, participants were introduced to the concept of ecopreneurship and the importance of environmental sustainability through the processing of durian waste into economically valuable products. The second day focused on introducing various AI applications through printed modules, accompanied by hands-on practice sessions using participants' personal gadgets through training modules designed to be contextual, applicable, and easily understood by the Kampung Durian community. The module includes an introduction to the basic concepts of AI, its application in sustainable entrepreneurship, and technical guidance on using several popular AI platforms such as Canva AI for product packaging design, Copy.ai and ChatGPT for promotional content creation, and Google Trends for market trend analysis. Participants are invited to create packaging designs, promotional content, and develop digital marketing strategies utilizing AI features. The third day culminates in an integrated practice that participants create processed products from durian waste, then design and disseminate their digital promotional materials through social media. This activity aims for participants to not only gain conceptual understanding but also practical skills in innovatively managing local resources and utilizing AI technology to enhance product competitiveness. With a training approach based on practice and technology, it is expected that there will be a significant and sustainable increase in digital entrepreneurship among the people of Pakis Village.

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Figure 2. Ecopreneurship Training based on Artificial Intelligence

The integration of ecopreneurship and artificial intelligence (AI) in rural communities has become a transformative strategy to enhance economic inequality. Ecopreneurship especially those involving women and marginalized groups is increasingly recognized as a sustainable pathway for community empowerment and green innovation [7]. Based on the principles of the circular economy and local potential, ecopreneurship initiatives leverage environmental awareness to foster the creation of micro-enterprises, particularly in areas with limited industrial access and environmental challenges. Durian biomass waste, primarily in the form of peels and seeds, has been identified as a valuable resource to be processed into value-added products such as biochar, animal feed, and alternative food ingredients [20]. This application not only reduces environmental waste but also opens new sources of income for rural communities

Recent empirical studies in various countries highlight the important role of AI in supporting sustainable development and entrepreneurship, particularly in rural areas. Educational technology-based AI and appropriate decision support systems can allow micro-enterprises in rural areas to implement more efficient and data-driven practices [25], [26]. The majority of the Kampung Durian community is engaged in the durian agro-industry and the implementation of ecopreneurship training-based AI aligns with global trends in green innovation and business models-based community. However, the main obstacle in the implementation of Ecopreneurship based AI in rural areas is the low level of digital literacy. Rural communities in Indonesia still face challenges in accessing and mastering digital technology. Digital literacy in rural Indonesia encompasses four main dimensions: skills, ethics, security, and culture [27]. These dimensions become the basic capacities for integrating AI in the development of small businesses that the role of AI in personalization and customer engagement is crucial [16]. Thus, digital entrepreneurship training combined with local ecological knowledge and AI systems can foster the emergence of technologically competent rural ecopreneurs who are also environmentally responsible.

The convergence of AI, digital literacy, and the utilization of ecological resources supports the grand goals of the Sustainable Development Goals (SDGs) particularly in reducing poverty. Therefore, participatory and community-based approaches are key to ensuring that ecopreneurship based on AI programs are culturally relevant, ethically grounded, and economically viable for rural communities. Empowering local actors with tools, knowledge, and networks to transform waste into value is a tangible example of the transformative potential of ecologically based on digital entrepreneurship at the grassroots level. The

ecopreneurship training based on Artificial Intelligence (AI) in Pakis Village showed a significant increase in the community's digital literacy.

Table 1. Average Digital Understanding Score of Participants

Test	Average Score	Category
Pre-Test	41.2	Low
Post Test	88.1	High

The ecopreneurship training based on Artificial Intelligence (AI) in Pakis Village shows a significant increase in the community's digital literacy. As seen in Table 1, the pre-test results showed an average digital understanding score of 41.2 among participants, while the post-test score increased to 88.1, with an improvement of 113.9%. This increase reflects the effectiveness of the transformative learning approach, where direct involvement in digital practices significantly impacts the enhancement of participants' competencies and attitude changes. These findings are supported with research by Sugeng (2022) which concluded that AI-based learning can significantly improve access to and the quality of knowledge in rural areas [28], [29]. Research by Yusuf (2024) states that teacher training in the development of AI-based teaching modules successfully improved teachers' digital literacy [30].

These findings indicate that direct involvement in digital practices has a significant impact on the improvement of participants' competencies and attitude changes. The increase in digital understanding among the Kampung Durian community during this training is due to an applied, simple learning approach that directly addresses the real needs of the participants. The use of training modules based on real cases and practical guidance using Artificial Intelligence applications such as Canva AI, ChatGPT, and Copy.ai makes it easier for participants to understand the concrete benefits of digital entrepreneurship. In addition, the provision of supportive facilities and an interactive training atmosphere also encouraged the participants' enthusiasm. This is reflected in their active participation during the discussion process, the practice of creating marketing content, and their courage in presenting product development ideas. The combination of contextual training methods and the use of easily accessible technology has been the key to fostering a learning spirit and significantly improving the digital literacy of the community. The results of participatory observations during the training showed enthusiasm and active engagement from the participants can be seen in Table 2.

Table 2. Level of enthusiasm and active engagement of participants

Aspect Observed	Finding
Attendance and participation	Attendance rate reached 95%; discussion participation 87%
Exploration of AI technology	80% of participants actively try the AI features independently.
Collaboration among participants	Cooperation occurred in the creation of promotional content
Comparison of manual vs AI results	90% say AI results are faster and more engaging.

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Participatory observation during the ecopreneurship training based on Artificial Intelligence (AI) in Pakis Village showed enthusiasm and active engagement from the participants, with an attendance rate of 95% and discussion participation of 87%. As many as 80% of participants actively tried the AI features independently, and 90% stated that the results with AI were faster and more interesting. These findings align with the study by Kamutuezu (2021), which emphasizes the importance of tailored training for local communities to optimize technology adoption. Therefore, training specifically designed for local needs is crucial to enhance technology adoption in rural communities. Interviews with several participants showed an increase in confidence in using technology. Several quotes support these findings. One of the female respondents, aged 39, stated, "*I used to be confused about how to make promotions, now I can use Canva AI and ChatGPT*." Next, one of the female respondents, aged 24, recounted, "*At first, I was skeptical about ChatGPT, but it turned out to be very helpful in creating product descriptions.*" This was reinforced by a 46-year-old female respondent who said, "*Now I am confident posting on Facebook, I know how to write engaging words.*"

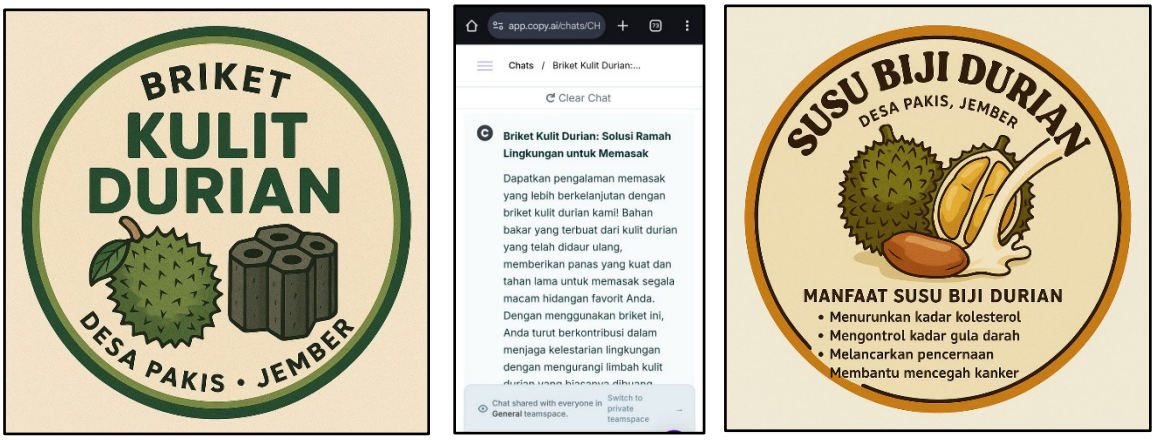

Figure 3. Example of Sticker Products and Product Descriptions Using Artificial Intelligence

As seen in Figure 3, the ecopreneurship training based on Artificial Intelligence (AI) in Pakis Village has had a tangible impact on the promotion and packaging strategies of durian waste-based products. For example, briquettes made from durian peels are now marketed through Facebook and WhatsApp with the help of captions from Copy.ai and visual designs from Chat GPT. Durian seed milk products are promoted on Instagram and TikTok using short videos with educational narratives generated by AI. This strategy not only enhances the product's appeal but also expands market reach through digital platforms that are easily accessible to rural communities. The findings show that the training had a direct impact on the promotion and packaging activities of durian waste-based products in Figure 3. The research findings indicate that participants have begun to create innovations post-training, including: 1) The use of digital promotion templates based on local culture; 2) The creation of product catalogs using Canva AI; 3) The idea of a YouTube channel about the process of making durian briquettes. This initiative demonstrates that learning is continuous and encourages independent innovation. Training also creates a shift in mindset from being technologically challenged to being digitally adaptive in Table 3.

As seen in Table 3, as many as 75% of participants stated that technology is now perceived as easy and accessible to anyone, including those without a higher education background. The training generated wider social impacts, including the formation of independent study groups, collaboration across participant teams, and active support from village leaders that

strengthened digital motivation. This demonstrates the role of training as a catalyst for new productive social capital. This is due to a good digital communication strategy with the help of AI, which enhances the appeal and market value of the product, especially because of the ecological narrative and more attractive visual design. Women's empowerment emerged as a significant outcome: 60% of participants were women, many of whom became pioneers in online product promotion and community based digital education for children. This shows that AI can be a transformative tool in promoting women's digital leadership in villages.

Table 3. Change in Mindset About Technological Convenience

Behavioral Aspects	Before Training	After Training
Confident in using AI	15%	85%
Product promotion via social media	10%	70%
Creating independent digital designs	5%	90%
Using an engaging promotional narrative	5%	85%

However, structural challenges remain and need to be carefully considered for the long-term sustainability of the program. The limited training duration restricted the depth of material mastery, as participants had insufficient time to fully explore advanced AI features and develop more complex entrepreneurial strategies. A three-day intervention is effective for generating initial enthusiasm, but it is not adequate for fostering comprehensive digital competencies that require repetitive practice, continuous mentoring, and gradual adaptation. In addition, unequal access to devices and internet connectivity hindered full participation, with some participants relying on shared smartphones and unstable connections that disrupted the learning process. This reflects the broader issue of the rural digital divide in Indonesia, where infrastructural gaps often prevent equitable access to technological innovation [17], [18].

Systematic follow-up from village authorities also has yet to be institutionalized, which limits the continuity of the empowerment process. Without ongoing monitoring, refresher training, or integration into village development programs, there is a risk that the momentum generated during the training will decline over time. Similar findings have been reported in community empowerment projects in Southeast Asia, where initial gains from digital literacy initiatives often diminished due to lack of policy support and weak institutional frameworks [20]. Furthermore, participatory methodologies such as PAR highlight that sustainability requires not only short-term engagement but also structural embedding of programs into local governance and community practices. These limitations highlight that while community-based AI and ecopreneurship training can catalyze immediate improvements, sustainable outcomes depend on multi-stakeholder collaboration involving local governments, universities, and private sector partners. Thus, to ensure the sustainability and positive impact of ecopreneurship training-based AI in Pakis Village, continuous support from various parties is needed, including the government, technology service providers, and the community itself. Policies that support technology access in rural areas, such as device and data subsidies, as well as ongoing training will be crucial in addressing existing challenges and strengthening community empowerment through technology.

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4. Conclusion

The ecopreneurship based on AI in Pakis Village successfully improved digital literacy, community empowerment, environmentally friendly product innovation, and the formation of social capital. The key to success lies in locally relevant training, infrastructure support, and an inclusive approach that is gender-sensitive. This model training can serve as an example for the development of ecopreneurship and digital literacy in other rural communities in Indonesia.

This research contributes to the growing body of literature on ecopreneurship and AI by presenting a participatory model that integrates ecological sustainability with digital entrepreneurship in rural contexts. It demonstrates that AI is not only a tool for marketing efficiency but also a catalyst for socio-ecological innovation, gender-inclusive empowerment, and the development of rural innovation ecosystems. The findings underscore the importance of multi-stakeholder collaboration. Local governments can support sustainability through digital infrastructure and inclusive policies; universities can strengthen community capacity through research-based extension; and CSR initiatives can provide resources to ensure long-term program continuity. Future research should examine the scalability of this model across different rural contexts in Southeast Asia, assess long-term sustainability beyond short training interventions, and explore the role of AI in fostering resilience against structural challenges such as digital inequality and limited institutional support.

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