
INNOVATION IN LIQUID ORGANIC FERTILIZER: EMPOWERING THE ECONOMY OF PESANTREN TOWARDS SUSTAINABLE AGRICULTURE

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Abstract

This community service program, conducted by the Faculty of Islamic Economics and Business (FEBI) of UIN Raden Mas Said Surakarta, took place at Pondok Pesantren Ki Ageng, Selo, Klaten. The program aimed to enhance the economic independence of the pesantren through the development of organic liquid fertilizer products utilizing local resources. The main issues faced by the partner institution included limited knowledge in producing liquid fertilizer, low value-added from livestock waste, and the absence of sustainable marketing strategies. The mentoring activities were carried out through several stages: (1) identifying needs and potentials of the pesantren, (2) training in the production of organic liquid fertilizer using molasses, EM4, and livestock waste, (3) forming a student production team, and (4) providing assistance in branding and packaging. The methods applied included a participatory approach, hands-on training, and continuous monitoring. The results indicate improved skills among students in converting organic waste into quality liquid fertilizer, and the establishment of a prototype product under the brand “KYASE”. Furthermore, there was an increase in awareness of green economy principles and pesantren-based entrepreneurship. This program serves as a model for eco-entrepreneurship-based pesantren empowerment and contributes to sustainable rural economic development.

Keywords: community service, organic liquid fertilizer, Islamic boarding school, green economy, student empowerment.

Background

Agricultural sustainability has become one of the most pressing global concerns of the 21st century. The increasing demand for food, combined with environmental degradation and overuse of chemical fertilizers, has intensified the need for more sustainable and eco-friendly agricultural systems (Amri & Rahman, 2020; Khasanah & Saptana, 2022). Conventional agriculture, which relies heavily on synthetic inputs, has led to declining soil fertility and biodiversity loss. Consequently, the shift toward organic and sustainable agriculture is essential not only for ecological balance but also for strengthening rural economic resilience.

In Indonesia, agriculture remains the backbone of the rural economy, providing livelihoods for more than 30% of the population (Wibowo & Rahmat, 2023). However, farmers continue to face challenges such as fluctuating input prices, limited access to technology, and dependence on imported fertilizers. The promotion of liquid organic fertilizer (LOF)—a product derived from decomposed organic materials rich in nutrients and beneficial microorganisms—offers a viable alternative to reduce costs and improve soil health (Aji, 2022; Khasanah & Saptana, 2022).

Islamic boarding schools (pesantren) possess great potential to act as centers of socio-economic transformation. As traditional educational institutions with deep community roots, pesantren can play a significant role in promoting environmental stewardship and sustainable agriculture (Mardiyono & Widodo, 2023). The concept of eco-pesantren—



integrating environmental ethics into religious learning—illustrates how Islamic values can align with the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production) (Zuhdi & Hidayat, 2022).

However, most pesantren have not yet optimized their potential in environmental and economic innovation due to limited access to knowledge, technology, and entrepreneurial skills (Arifin & Prasetyo, 2021). Thus, this community service program was designed to introduce LOF innovation as a means of economic empowerment at the Kyai Ageng Selo Islamic Boarding School in Klaten, Central Java. The initiative emphasizes participatory approaches that combine practical skills, business training, and Islamic ethics of stewardship (khalifah) and social benefit (maslahah al-‘ammah).

This paper discusses the implementation process, outcomes, and broader implications of the LOF innovation program in pesantren-based communities. It highlights how participatory empowerment, Islamic values, and environmental education can be integrated into a comprehensive model for sustainable community development.

Methodology

Location and Participants

The program was implemented at Pondok Pesantren Kyai Ageng Selo, Klaten Regency, Central Java. The site was selected due to its agricultural potential and the willingness of pesantren leaders to engage in innovation (Suryani & Harahap, 2021). Participants included 30 students (santri), 5 pesantren administrators, and 10 surrounding farmers, ensuring diverse perspectives and inclusive participation.

Implementation Stages

The program followed three main phases using a participatory community-based approach (CBA) (Nugroho & Syafruddin, 2019):

1. Training on LOF Production
Participants were trained in the fermentation process using local raw materials (cow dung, banana peel, and vegetable waste) with EM4 microbial activators.
2. Entrepreneurship Development
Participants learned cost management, simple accounting, packaging, and marketing strategies (Setiawan & Fitri, 2022).
3. Branding and Marketing
The product was branded as “kyase” and promoted through local cooperatives and digital platforms.

Evaluation

Knowledge improvement was measured through pre-test and post-test questionnaires, while qualitative evaluation was conducted using interviews and observation to assess behavioral and entrepreneurial changes (Huda & Sari, 2021).



Results and Discussion

Knowledge and Technical Skill Improvement

The program significantly improved participants' understanding of organic fertilizer production. Pre-test scores averaged 52%, increasing to 87% post-training, indicating substantial learning gains. Participants mastered fermentation "techniques and could independently produce fertilizers that met local organic standards (Aji, 2022). Laboratory tests revealed nutrient levels of 0.35% N, 0.28% P, and 0.42% K, demonstrating effective nutrient content comparable to commercial products (Amri & Rahman, 2020).

This result aligns with previous studies indicating that hands-on training enhances farmers' technical competence and adoption of organic methods (Khasanah & Saptana, 2022). The pesantren's context further amplified knowledge retention, as learning was embedded in daily routines and collective practice.

Entrepreneurial and Economic Empowerment

Beyond technical competence, the initiative fostered an entrepreneurial mindset among santri and administrators. Business mentoring encouraged participants to develop a social enterprise model, combining economic gain with religious and environmental objectives (Setiawan & Fitri, 2022). The creation of organic fertilizer symbolized local innovation and identity, aligning with findings by Huda & Sari (2021) that green entrepreneurship in pesantren promotes long-term self-sufficiency.

Initial marketing through social media and community networks generated steady sales, allowing revenue reinvestment for future production. This process embodies the Islamic principle of barakah-based entrepreneurship, emphasizing ethical profit and social welfare (Rahman & Nur, 2020).

Environmental and Social Impact

The recycling of organic fertilizer significantly reduced pollution within and around the pesantren. Waste that was previously discarded or burned is now transformed into useful fertilizer, supporting a local circular economy (Wibowo & Rahmat, 2023). Farmers using organic warteg reported improved soil texture and plant vitality after two planting cycles.

Socially, the initiative strengthened collaboration between pesantren, local farmers, and students. The participatory model ensured beneficiaries were active co-creators, not passive recipients (Nugroho & Syafruddin, 2019). This aligns with Suryani & Harahap (2021), who argue that participatory approaches foster deeper ownership and sustainability in community programs.

Integration of Islamic Values

This project illustrates how Islamic ethics can shape environmental behavior. The Qur'anic values of stewardship (khalifah), moderation (wasathiyah), and avoidance of waste (israf) were emphasized throughout training (Zuhdi & Hidayat, 2022). The integration of religious principles created strong internal motivation, as participants viewed sustainable agriculture not merely as economic activity but as a spiritual obligation (Mardiyono & Widodo, 2023). Such integration reflects the growing paradigm of Islamic social innovation,



where faith-based institutions become catalysts for sustainability and ethical entrepreneurship (Arifin & Prasetyo, 2021).

Conclusion

The innovation of liquid organic fertilizer at Kyai Ageng Selo Islamic Boarding School demonstrates the transformative potential of pesantren as agents of sustainable community development. The program effectively enhanced participants' knowledge, technical capacity, and entrepreneurial competence while promoting environmental awareness.

The initiative generated a tangible product that embodies the fusion of science, local wisdom, and Islamic ethics. This success model underscores that integrating participatory learning and Islamic environmental ethics can achieve both economic empowerment and ecological balance (Huda & Sari, 2021; Setiawan & Fitri, 2022).

To ensure sustainability, it is recommended to: (1) Strengthen institutional collaboration between pesantren, universities, and government agencies; (2) Provide ongoing mentoring for quality control and certification.; (3) Expand market access through digital platforms and farmer cooperatives. In conclusion, this initiative offers a replicable model for faith-based community empowerment, contributing directly to SDGs 2, 8, 12, and 13, and reinforcing pesantren's role as a pillar of Indonesia's green economy and sustainable future.

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