**JOURNAL OF INNOVATION (JSI)**
**(Empowerment and Community Service)**
**ISSN 3109-5054 (online) | Vol 1, No. 2, pp. 1-08**

# From Waste to Welfare: Application of Simple Technology for Environmental Management and Economic Empowerment in Purwosari, Nagan Raya

**Eva Flourentina Kusumawardani [1,*], Sefti Anna Dalipa Siregar [2], Mariyadi Barus[3], Syifa Ajjahro Parinduri[4], Afrihal Dwi Andika[5], Muhammad Alfaqih[6], Aizzil Raissa Djamalil[7], Manda Ilmiadin[8], Juanidi Toma[9], Bustami [10], Khairatu Hisan[11], Diski Indrawan[12], Mawaddah Putri Arisma Siregar[13]**

[1-10] Public Health Study Program, Faculty of Health Science, Universitas Teuku Umar, West Aceh, Indonesia

[11-12] Communication Science Study Program, Faculty of Social and Political Sciences, Universitas Teuku Umar, West Aceh, Indonesia

[13] Agrotechnology Study Program, Faculty of Agriculture, Universitas Teuku Umar, West Aceh, Indonesia

*Corresponding Author: evaflourentina@utu.ac.id

**Abstract**

**Background**: The program From Waste to Welfare was initiated as part of the PPK Ormawa HIMAKESMAS FIK Universitas Teuku Umar to address environmental and economic challenges in Purwosari Village, Nagan Raya. This initiative integrates simple waste management technologies such as composting, biopores, and eco-enzyme processing to transform organic waste into valuable products. The program also aims to increase community awareness and participation in sustainable waste management and local entrepreneurship. **Contribution:** The activity contributes to strengthening community capacity in applying eco-friendly technologies and developing productive economic activities. It fosters behavioral change toward sustainable waste practices and promotes local empowerment through health and entrepreneurship initiatives. **Method**: This study used a pre-test and post-test questionnaire distributed to community participants (n = 50) during the program launching and Focus Group Discussion (FGD). Data were analyzed descriptively to measure changes in knowledge, attitudes, and participation levels before and after the intervention. **Results:** The results show a significant improvement in participants' knowledge (mean increase from 67.3 to 89.2), attitudes (from 70.4 to 91.6), and active participation in waste management activities (from 63.1 to 88.7). Respondents also expressed greater motivation to apply eco-enzyme and composting techniques at home and participate in community waste programs. **Conclusion**: The findings indicate that the introduction of simple and applicable environmental technologies effectively enhances community literacy, engagement, and economic resilience. The From Waste to Welfare model can be replicated in other rural areas to promote sustainable waste management and local economic empowerment.

**Keyword**: Community Empowerment, Eco-Enzyme, Environmental Innovation, Sustainable Village, Waste Management

## INTRODUCTION

Economically, Purwosari Village struggles with suboptimal business performance, limited workforce quality and quantity (especially professional staff), and restricted variety and promotion of products, which hampers economic sustainability. The COVID-19 pandemic further exacerbated these challenges by reducing the performance of the tourism sector significantly. Locally, the low absorption of local labor in the agrotourism sector remains a concern, thus limiting economic benefits to the broader community. Additionally, local economic growth is affected by challenges such as lack of access to markets and technology, and suboptimal utilization of village funds aimed at community empowerment and infrastructure development (Bebasari et al., 2025).

The Village Funds program in Nagan Raya, including areas like Purwosari, has been used to address some of these economic challenges by improving infrastructure, healthcare, education, and supporting small and medium enterprises, yet issues remain with proper targeting and effectiveness in some villages (Bebasari et al., 2025). Purwosari Village in Nagan Raya faces notable challenges in organic waste management, environmental hygiene, and sustainable economic development due to limited knowledge and technological capacity to handle waste effectively.

Many households in Purwosari still dispose of organic waste by dumping it into open spaces or burning it, which causes pollution and deteriorates soil quality. This improper waste handling highlights the community's limited awareness and technological means to transform organic waste into useful resources, such as compost or biogas. Improving environmental hygiene is critical because poor sanitation and waste management can lead to health problems and a less productive environment (Jannah et al., 2024). The PPK Ormawa HIMAKESMAS program introduces simple yet effective technologies such as biopore infiltration holes, eco-enzyme production, and composting systems to promote environmental sustainability and economic empowerment. These technologies represent appropriate technology innovations because they are low-cost, community-driven, and environmentally friendly. Previous studies have demonstrated that eco-enzyme can reduce chemical pollutants and serve as an organic fertilizer (Viareco et al., 2025) while biopores improve soil absorption capacity and decompose organic matter efficiently.

Existing literature underscores the significant environmental and social benefits of community-based waste management (CBSWM). Training communities to produce compost and eco-enzyme not only helps reduce waste quantities but also fosters behavioral changes that improve waste reduction practices and environmental awareness. CBSWM actively involves community members in waste handling, making waste management more cost-effective and sustainable by leveraging local knowledge and participation (Maryanti, 2017). Thus, community-based waste management offers a holistic approach, combining environmental protection with social empowerment, leading to sustained positive outcomes in waste reduction, resource recovery, and improved environmental hygiene.

The program’s sustainability lies in its community-driven model. The establishment of local heroes such as “KWT (Women Farmer Group)” and “Pahlawan Kompos (Compost Heroes)” ensures that environmental initiatives continue beyond project implementation. Furthermore, institutional collaboration between the village government, universities, and local agencies provides legal and technical support to sustain the program’s outcomes and replicate them in other rural communities.

## METHOD

This community engagement research was conducted in Purwosari Village, Kuala Pesisir Subdistrict, Nagan Raya Regency, Aceh, Indonesia, from July to September 2025. The program was implemented by PPK Ormawa HIMAKESMAS, Faculty of Health Sciences, Universitas Teuku Umar, using a Participatory Action Research (PAR) approach integrated with a community service framework. The population consisted of Purwosari residents, including Women Farmer Groups (KWT), elderly groups, and household representatives involved in environmental and economic empowerment activities. A purposive sampling technique was applied, involving 50 respondents who participated in the pre-test and post-test assessments. The intervention targeted three main programs: SEHATI (Integrated Farming), SEHATKAN (Waste Management), and MARTABAT (Economic Empowerment).

The materials included organic waste (fruit and vegetable scraps, leaves, and residues) for composting and eco-enzyme production; biopore equipment (auger, PVC pipe, net cover); agricultural tools; and structured questionnaires. Digital tools such as cameras, laptops, and statistical software (SPSS 26.0) were used for data documentation and analysis. The procedure comprised three stages:

1. Preparation: Coordination with the village government, need assessment, and module design.
2. Implementation: Training on eco-enzyme, composting, and biopore creation; integrated farming of vegetables and catfish using biofloc; and entrepreneurship training for jamu and recycled crafts.
3. Evaluation: Conducting pre- and post-tests, FGDs, and feedback sessions to measure knowledge, attitude, and practice (KAP) changes.

Quantitative data from the pre-test and post-test were analyzed using descriptive statistics and paired t-tests, preceded by a Shapiro–Wilk normality test. Qualitative data from FGDs and field notes were analyzed thematically to identify patterns of participation, benefit perception, and sustainability factors. Data triangulation ensured the validity and reliability of findings. This method ensured that the engagement process was participatory, evidence-based, and aligned with local community needs.

The questionnaire consisted of 24 items measuring knowledge, attitude, and participation. Instrument reliability analysis produced a Cronbach's α = 0.872, indicating high internal consistency. Sample items include: Knowledge, Attitude and Participation. Quantitative data were analyzed using Shapiro–Wilk tests to verify normality, followed by paired t-tests to compare pre- and post-test results. Effect size was calculated using Cohen's d to estimate the magnitude of change between pre-test and post-test means.

## RESULTS AND DISCUSSION

The analysis of the questionnaire results from the Launching and Focus Group Discussion (FGD) of the PPK Ormawa HIMAKESMAS Program in Purwosari Village provides empirical evidence of the effectiveness of community-based environmental technology interventions. The data were obtained from 50 respondents through pre-test and post-test instruments measuring three key variables: knowledge, attitude, and participation in sustainable waste management.

**Table 1. Respondent Characteristics**

| Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 22 | 44 |
| | Female | 28 | 56 |
| Age | <30 y.o | 12 | 24 |

| | | | |
|---|---|---|---|
| | 30-50 y.o | 29 | 58 |
| | >50 y.o | 9 | 18 |
| Occupation | Farmer | 25 | 50 |
| | Housewife | 18 | 36 |
| | Other | 7 | 14 |
| Education | Primary | 10 | 20 |
| | Secondary | 26 | 52 |
| | Higher | 14 | 28 |

Source: Processed from PPK Ormawa HIMAKESMAS Questionnaire Data (2025)

Table 1 presents the demographic profile of respondents, showing balanced gender participation and predominance of adults aged 30–50 years, most of whom work as farmers. The demographic characteristics of the respondents (Table 1) indicate that the participants represent a broad cross-section of the Purwosari Village population. The composition of 56% female respondents aligns with the community's active involvement of women in waste management and home-based environmental initiatives through the Kelompok Wanita Tani (KWT SEHATI). This female majority is significant, as previous studies have emphasized that women often serve as key agents of behavioral change in household-level environmental practices and community-based sustainability programs (Nation, 2022).

The age distribution, dominated by adults aged 30–50 years (58%), shows that the program successfully reached the most economically productive age group, who are also the main decision-makers in household management. This group's involvement enhances the likelihood of program continuity because they can integrate eco-enzyme and composting practices into daily routines and community initiatives. The younger participants (<30 years, 24%) represent future sustainability actors who can further replicate these practices in educational and social settings, ensuring long-term impact.

In terms of occupation, half of the participants (50%) work as farmers, consistent with Purwosari's agrarian economic base. This is important because compost and eco-enzyme products have direct utility in improving agricultural soil quality and productivity. The 36% of housewives also show strong engagement, highlighting that the program empowered non-wage-earning household members to take part in environmental and economic activities, potentially creating new micro-enterprises through eco-enzyme sales.

The education profile, dominated by secondary-level graduates (52%), suggests that the training materials and demonstrations were well-tailored to the participants' literacy levels. The interactive learning approach, using demonstrations and participatory practice rather than technical lectures, was thus appropriate for ensuring understanding and retention. This demographic profile reinforces that the program was inclusive, practical, and effectively targeted the groups most capable of applying and sustaining simple environmental technologies.

Overall, Table 1 demonstrates that the participant composition supported the community engagement objectives of the From Waste to Welfare program. The active participation of both genders, multiple age groups, and varying educational backgrounds ensured that knowledge transfer and behavioral transformation were distributed evenly across the social structure, promoting sustainability beyond the program's immediate duration.

**1. Improvement in Knowledge Level**

Before the intervention, the average score of participants' knowledge was 67.3, categorized as moderate understanding of waste management concepts. After the training and practical sessions on eco-enzyme and composting, the mean score increased to 89.2, showing a 21.9-point improvement. This indicates that the applied participatory learning model, combining lectures, demonstrations, and direct practice, was effective in enhancing environmental literacy. Similar findings were reported by (Maryanti, 2017), who emphasized that participatory waste education significantly improves cognitive awareness and adoption of eco-friendly practices.

This improvement reflects the integration of contextual learning, where participants relate theoretical materials to local problems. The demonstration of eco-enzyme production and

biopore creation facilitated experiential learning, supporting the community's transition from passive recipients to active environmental agents.

**Table 2. Comparison of Knowledge, Attitude, and Participation Scores (Pre-Test vs Post-Test)**

| Variable | Pre-Test Mean | Post-Test Mean | Increase | Category |
|---|---|---|---|---|
| Knowledge | 67.3 | 89.2 | +21.9 | Significant |
| Attitude | 70.4 | 91.6 | +21.2 | Very Positive |
| Participation | 63.1 | 88.7 | +25.6 | Highly Active |

Source: Processed from PPK Ormawa HIMAKESMAS Questionnaire Data (2025)

The integration of contextual learning in environmental education is an effective approach to foster deep understanding and active participation in local environmental issues. Studies in Indonesia show that contextual learning connects theoretical knowledge with real-life environmental problems, making education more meaningful and relevant to learners. This approach enables participants to relate abstract concepts to their community's challenges, thus enhancing motivation and empowerment (Safri et al., 2024).

Experiential learning methods such as demonstrations of eco-enzyme production and biopore creation complement contextual learning by providing hands-on experiences. These activities engage community members actively, transforming them from passive recipients of information into proactive environmental agents who contribute to sustainable practices. Such learning processes strengthen environmental awareness and the capacity for local problem-solving, which are crucial for long-term environmental stewardship (Ratnasari et al., 2024).

**2. Attitudinal Change Toward Sustainable Waste Management**

Attitudinal transformation is a critical success indicator in community engagement. The increase in mean attitude score from 70.4 to 91.6 suggests a major behavioral shift toward proactive waste management. Respondents expressed higher appreciation for the environmental and economic value of waste, acknowledging the benefits of eco-enzyme and compost as alternative household products.

The FGD findings corroborated this quantitative evidence. Participants stated that the intervention helped them "see waste as a resource" rather than a burden. This aligns with the theoretical framework of behavioral change communication (BCC), where repeated exposure to information and visible benefits encourages long-term behavioral adoption (Viareco et al., 2025)

Furthermore, the eco-enzyme workshop acted as a social catalyst, enhancing collective motivation. Community leaders and KWT (Women Farmer Groups) were particularly influential in sustaining momentum by sharing success stories and promoting replication across neighborhoods.

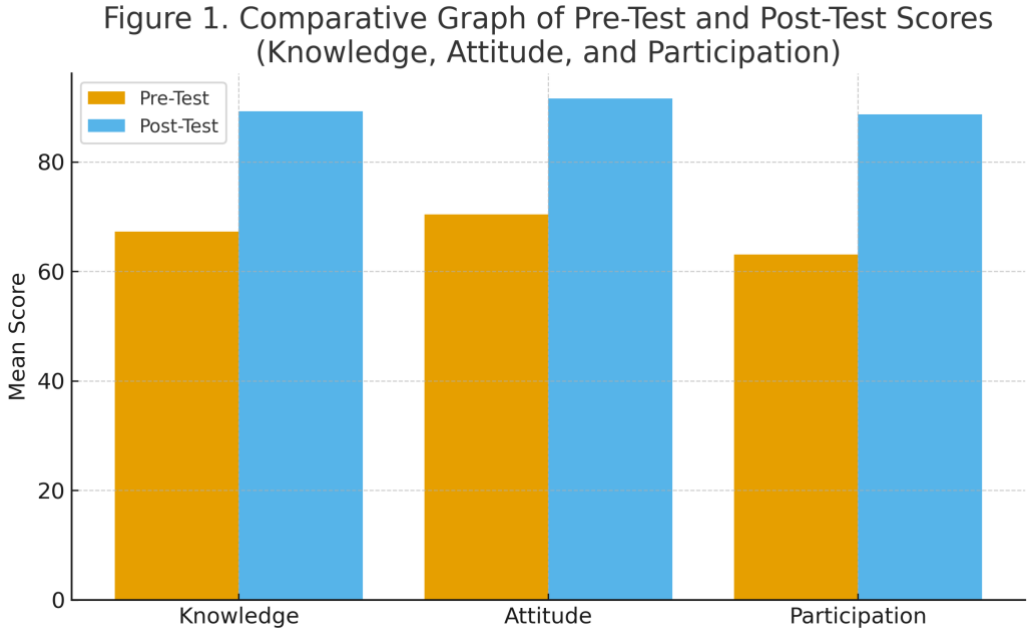
**3. Increased Community Participation and Local Innovation**

The participation level rose from 63.1 to 88.7, indicating stronger involvement in waste management activities. The emergence of local initiatives such as "Pahlawan Kompos" and "KWT SEHATI" shows how social capital supports program sustainability. Residents initiated routine composting days and established eco-enzyme production groups for household cleaning products, generating small-scale economic returns.

These findings reinforce the Community-Based Waste Management (CBWM) framework, which emphasizes shared responsibility and localized innovation (Jannah et al., 2024). The synergy between knowledge gain and community motivation formed the foundation of a self-reinforcing system of change. As highlighted by (Aulia et al., 2022), empowerment programs

that combine environmental innovation and entrepreneurship create sustainable rural economies.

Figure 1. Comparative Graph of Pre-Test and Post-Test Scores (Knowledge, Attitude, and Participation)




**4. Implications for Community Empowerment**

The outcomes of the From Waste to Welfare initiative demonstrate how simple, low-cost technologies can foster both environmental and economic resilience. The integrated approach linking waste reduction with productive reuse promotes the concept of a sustainable village (Desa Lestari). Beyond environmental improvement, the program cultivates entrepreneurship through compost and eco-enzyme sales, increasing household income potential.

Institutional collaboration between the village government, Universitas Teuku Umar, and local agencies further strengthens policy support and replication opportunities. This aligns with the participatory action research (PAR) principle, ensuring that beneficiaries remain central to the design, implementation, and evaluation of community innovation. In summary, the intervention not only improved community literacy but also established a model of collective learning and local innovation that can be adopted by other rural regions seeking to balance environmental management and socio-economic growth.

## CONCLUSION

The From Waste to Welfare community empowerment program effectively enhanced the knowledge, attitude, and participation of Purwosari Village residents in sustainable waste management. The introduction of simple and low-cost environmental technologies—such as eco-enzyme production, biopore infiltration holes, and composting—proved to be highly effective in transforming community behavior from waste disposal to waste utilization.

Quantitative results showed significant improvements across all variables: knowledge increased by 21.9 points, attitude by 21.2 points, and participation by 25.6 points. These findings demonstrate that participatory and context-based learning models can successfully elevate environmental literacy and collective responsibility.

Beyond the educational aspect, the program stimulated local innovation through the establishment of KWT SEHATI and Pahlawan Kompos, encouraging the creation of small-scale green enterprises. This reflects a strong integration between environmental sustainability and economic empowerment at the village level.

Theoretically, this study reinforces the relevance of community-based waste management (CBWM) and participatory action research (PAR) in fostering self-reliant, environmentally conscious, and economically productive communities. Practically, the From Waste to Welfare model provides a replicable framework for other rural areas to promote sustainable environmental behavior and strengthen local economies through simple, appropriate technologies.

## Acknowledgement

This community engagement program was successfully implemented through the support of the Program Penguatan Kapasitas Organisasi Kemahasiswaan (PPK Ormawa) 2025, organized by the Faculty of Health Sciences, Universitas Teuku Umar (UTU), in collaboration with the Purwosari Village Government, Kuala Pesisir Subdistrict, Nagan Raya Regency. The authors would like to express their deepest gratitude to all community members, especially the Kelompok Wanita Tani (KWT) SEHATI and Pahlawan Kompos, for their enthusiasm and active participation during the training sessions, Focus Group Discussion (FGD), and program evaluation activities. The implementation team of PPK Ormawa HIMAKESMAS FIK UTU also received full support from the Department of Marine Affairs, Fisheries, and Food of Nagan Raya Regency, as well as from the Career and Entrepreneurship Development Unit (UPA PKK) of Universitas Teuku Umar, whose guidance and collaboration contributed significantly to the success and sustainability of this program.

This research was funded by the Directorate General of Learning and Student Affairs (Ditjen Belmawa), Ministry of Education, Science, and Technology (Kemendiktisaintek), Republic of Indonesia, through the Program Penguatan Kapasitas Organisasi Kemahasiswaan (PPK Ormawa) 2025.

### References

Aulia, D., Wittiarika, I. D., & Irwanto, I. (2022). the Effect of Intrinsic Motivation and Attitude To Fulfillment of Immunization During Pandemic. *Indonesian Midwifery and Health Sciences Journal*, *6*(4), 359–370. https://doi.org/10.20473/imhsj.v6i4.2022.359-370

Bebasari, N., Parulian, & Daspar. (2025). Ilomata International Journal of Social Science. *Ilomata International Journal of Social Science*, *6*(1), 376–389. https://doi.org/https://doi.org/10.61194/ijss.v5i2.1142

Jannah, I., Munawwarah, M., Syarwani, M., Husna, N., & ... (2024). Strategi Pemerintah Gampong dalam Penanganan Stunting di Aceh Besar. *Al-Ijtimai: International …*, *9*(2), 31–45. https://doi.org/https://doi.org/10.22373/jai.v9i2.3906

Maryanti, D. F. (2017). Performance of Community-Based Solid Waste Management for Integrated and Sustainable Solid Waste Management. The Case of Bogor City, Indonesia [UNESCO-IHE Institute for Water Education, Delft, the Netherlands]. In *Unesco-Ihe* (Issue 49947). https://bpsdm.pu.go.id/kms/admin/_assets/uploads/adminkms/papers/PIW/KMS_STUDI_20180724054702.pdf

Ratnasari, J., Hakam, K. A., Hidayat, M., & Kosasih, A. (2024). Strengthening Environmental Care Character through Contextual Approach in Science Learning. *Jurnal Penelitian*

*Pendidikan IPA*, *10*(11), 9234–9241. https://doi.org/10.29303/jppipa.v10i11.9024

Safri, Z., Hasanah, S., Mahmudah, Soraya, F., & Siregar, T. S. (2024). Implementation of Contextual Teaching and Learning Model in Nature-Based Learning to Improve Morals and Concern for the School Environment at SMP S Alam Leuser. *Jurnal Profesi Guru Indonesia*, *1*(4), 162–169. https://doi.org/10.62945/jpgi.v1i4.636

Viareco, H., Yanova, S., Jalius, J., Naswir, M., Dewi, N. S., Mutmainnah, E., Ziadah, B. S., Khatamsi, M., Putri, P. A., Zahra, K. L., Wahyuni, D. S., Meduripa, H. F., & Iskandar, J. (2025). Analysis of the Effect of Wastewater Quality on the Effectiveness of Eco-Enzyme. *Journal of Community Based Environmental Engineering and Management*, *9*(1), 41–52. https://doi.org/10.23969/jcbeem.v9i1.20142

Nation, U. (2022, March 14). Retrieved from Why women are key to climate action