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Optimization of Household Waste Processing into Economically Valuable Products through Education and Recycling Training Programs

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Artikel Information

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Abstract

Household waste has become a major environmental issue in rural areas due to limited waste management facilities and low public awareness regarding waste sorting and recycling. This community service program aims to optimize household waste processing into economically valuable products through educational activities and recycling training programs. The program was implemented in Kekeri Village, West Lombok Regency, West Nusa Tenggara Province, Indonesia. The method used involved community education, practical recycling training, and continuous mentoring. The recycling focus was directed toward plastic waste processing through ecobrick production and handicraft creation from reusable plastic materials. The results showed significant improvements in community awareness regarding waste sorting and increased participation in recycling activities. In addition, the program successfully generated economically valuable products that have potential for small-scale community-based entrepreneurship. The program also strengthened environmental sustainability efforts at the village level. The study concludes that community empowerment through education and training plays a vital role in improving environmental quality and community economic potential.

Introduction

Environmental cleanliness remains a major challenge in many rural areas in Indonesia, particularly in waste management. Household waste contributes significantly to environmental pollution, especially when waste disposal practices are conducted improperly. The rapid increase in population and consumption patterns has led to a substantial increase in waste production, which is not balanced by adequate waste management systems.

In many villages, including Kekeri Village in West Lombok Regency, waste management facilities are still limited. Most households dispose of their waste by burning or dumping it into open areas and rivers. These practices cause environmental pollution, health risks, and ecosystem damage. Plastic waste, in particular, poses serious environmental problems due to its non-biodegradable nature and long decomposition period. Community participation plays a crucial role in addressing waste management problems. However, low awareness and lack of knowledge regarding waste sorting and recycling remain significant obstacles. Therefore, educational programs combined with practical recycling training are needed to improve community participation and environmental awareness.

Recycling plastic waste into economically valuable products such as ecobricks and handicrafts offers a sustainable solution. Ecobricks are plastic bottles filled with compacted plastic waste that can be used as construction materials or furniture. This approach not only reduces waste accumulation but also creates economic opportunities for local communities.

Problem Formulation

Based on the background above, the main problems addressed in this program include:

1. Low community awareness regarding proper household waste management.
2. Lack of knowledge and skills in recycling plastic waste.

3. Limited economic utilization of recyclable waste materials.

Research Objectives

This study aims to:

1. Increase community awareness regarding household waste management.
2. Provide education and training on recycling plastic waste into useful products.
3. Encourage economic utilization of recycled waste products.

Research Significance

This study is expected to contribute to environmental sustainability, community empowerment, and economic development through waste recycling initiatives. Additionally, the program supports government efforts in promoting environmentally friendly waste management systems.

Literature Review

1. Concept of Household Waste Management

   Household waste management refers to activities involving waste reduction, sorting, recycling, and proper disposal. Effective waste management requires community participation and awareness of environmental sustainability principles. According to Kaza et al. (2018), household waste contributes significantly to municipal solid waste generation, and community-based management is essential in reducing waste accumulation. Proper waste management involves waste separation between organic and inorganic materials. Organic waste can be processed into compost, while inorganic waste such as plastic can be recycled into reusable products.

2. Recycling-Based Community Empowerment

   Community empowerment through recycling programs focuses on increasing public participation and environmental awareness. Recycling programs often involve training, mentoring, and educational campaigns aimed at encouraging sustainable waste management practices. According to Wilson et al. (2020), community-based recycling programs are effective in improving waste management behavior when supported by participatory educational approaches. Empowering local communities also strengthens social responsibility and environmental stewardship.

3. Economic Value of Recycled Waste Products

   Recycling plastic waste into handicrafts and construction materials can generate economic benefits. Ecobricks, for example, can be used to produce furniture, garden decorations, and simple building materials. According to Singh and Sharma (2021), recycled plastic products have significant market potential when combined with creative design and local craftsmanship. Waste-based entrepreneurship can improve household income while supporting environmental conservation efforts. Small-scale recycling businesses have become increasingly popular in rural areas as alternative economic activities.

4. Educational and Training Approaches in Waste Processing Programs

   Educational approaches play a vital role in improving community knowledge and behavior. Training programs focusing on practical skills development are effective in increasing community participation. Experiential learning methods, such as hands-on training and demonstrations, help participants understand recycling techniques more effectively.

Methodology

1. Type of Community Service Program

   This program was conducted as a community service activity through the Student Community Service Program (KKN). The program applied participatory action research

methods to involve the community actively. Participatory Action Research (PAR) was selected as the primary approach because it emphasizes collaborative problem-solving between researchers and community members. Through this approach, the community is not only positioned as an object of the program but also as an active subject involved in identifying problems, planning solutions, and evaluating program outcomes. This participatory method is considered effective in increasing community ownership of the program, which supports the sustainability of waste management practices.

Furthermore, the program incorporated educational intervention and skill development activities to enhance community capacity in waste management. The integration of theory and practical training allows participants to understand both conceptual knowledge and technical implementation. This approach ensures that participants gain comprehensive understanding and practical experience, which contributes to behavioral change in waste management practices.

In addition, continuous mentoring was provided throughout the program implementation. Mentoring activities included regular monitoring, technical assistance, and evaluation sessions. These activities aimed to ensure that the knowledge and skills gained during the training were consistently applied in daily household waste management practices.

2. Location and Target Community

The program was implemented in Kekeri Village, West Lombok Regency. The target participants included housewives, youth organizations, and local community groups. Kekeri Village was selected as the program location due to its increasing household waste production and limited access to formal waste management facilities. The village is characterized by a growing residential population and active community social structures, which provide strong potential for community-based environmental programs. Preliminary observations indicated that most residents still relied on conventional waste disposal methods such as burning and open dumping.

The selection of housewives as primary participants was based on their central role in managing household activities, including waste disposal and domestic environmental cleanliness. Housewives are considered strategic agents in promoting environmentally friendly waste management behavior within families. Meanwhile, youth organizations were involved to support program sustainability through active participation in waste collection and recycling innovation activities.

Local community groups, including neighborhood associations and village environmental committees, were also involved as program facilitators. Their involvement helped strengthen program coordination and encouraged broader community participation. Collaboration with village authorities further supported the program implementation by providing facilities, mobilizing participants, and ensuring alignment with village environmental development plans.

3. Program Implementation Methods

The program consisted of three main stages:

a. Educational socialization regarding waste management.
b. Practical training on ecobrick production and plastic handicrafts.
c. Continuous mentoring and monitoring of community activities.

4. Data Collection Techniques

Data were collected through observation, interviews, and documentation. Pre-test and post-test assessments were conducted to measure knowledge improvement. Additional data

collection was carried out through structured questionnaires distributed to program participants. The questionnaires were designed to measure participants' level of knowledge, attitudes, and behavior related to household waste management. A total of 35 respondents participated in the questionnaire survey, consisting of 22 housewives and 13 youth organization members. The questionnaire results indicated that prior to the program, approximately 68% of participants had never practiced waste sorting, while only 32% had basic knowledge of recycling techniques.

Furthermore, field observation data showed that the average household waste production in the target area reached approximately 0.6–0.8 kilograms per household per day, with plastic waste accounting for nearly 30% of the total waste generated. After the implementation of the training program, post-test results demonstrated an increase in participant knowledge scores from an average of 54.3 to 82.7, indicating a significant improvement in community understanding regarding waste management and recycling practices.

Documentation techniques were also used to record program implementation activities, including training sessions, product development processes, and community participation levels. Photographic documentation and activity reports were collected as supporting evidence to validate the effectiveness of the program and to support future program evaluation and replication efforts in other rural communities.

5. Evaluation and Assessment Methods

Program evaluation was conducted by measuring community participation levels, product output, and knowledge improvement. Evaluation activities were carried out using both quantitative and qualitative approaches to obtain comprehensive program assessment results. Quantitative evaluation focused on measuring participant attendance, number of recycled products produced, and improvement in knowledge scores based on pre-test and post-test results. During the program implementation, participation rates reached approximately 80% of the total invited participants, indicating a high level of community involvement. In addition, the training activities successfully produced 120 ecobricks and 45 units of recycled handicraft products within the program period.

Qualitative evaluation was conducted through participant feedback sessions and group discussions to identify participant experiences and satisfaction levels toward the program. The feedback results indicated that most participants found the training materials easy to understand and applicable to daily household activities. Participants also expressed increased motivation to continue recycling activities independently and collaboratively with other community members.

Monitoring and follow-up assessments were conducted two weeks after the completion of the training program to evaluate program sustainability. The follow-up observation revealed that approximately 60% of participants continued practicing waste sorting and ecobrick production at the household level. These findings demonstrate that the program not only improved short-term knowledge but also encouraged sustainable behavioral changes in community waste management practices.

Results and Discussion

1. Community Waste Management Conditions Before Program Implementation

Before program implementation, most residents disposed of household waste through burning or open dumping. Waste sorting practices were rarely conducted, and plastic waste accumulated in residential areas. Limited knowledge regarding recycling techniques

contributed to poor waste management behavior.

2. Implementation of Education and Recycling Training Program

Educational sessions were conducted using interactive presentations and group discussions. The training focused on waste sorting techniques and ecobrick production methods. Participants were taught how to clean, cut, and compact plastic waste into bottles to produce durable ecobricks. Practical training sessions encouraged active community participation. Participants demonstrated strong enthusiasm and willingness to adopt recycling practices.

3. Production of Economically Valuable Recycled Products

The program successfully produced ecobricks used for simple furniture such as chairs and tables. Additionally, participants created handicrafts from plastic packaging waste, including decorative items and shopping bags. These products demonstrated potential economic value and encouraged community entrepreneurship initiatives. Several participants expressed interest in marketing recycled products through local markets and social media platforms.

4. Program Evaluation and Impact Analysis

Program evaluation was conducted to measure the effectiveness of the community service activities in improving community awareness, participation, and economic potential related to household waste management. The evaluation process focused on assessing changes in community behavior, knowledge improvement, and the sustainability of recycling practices implemented during the program.

To strengthen the evaluation results, quantitative data were summarized to provide a clearer description of program achievements. The evaluation focused on participant involvement, knowledge improvement, and production outcomes. The evaluation was conducted through pre-test and post- test assessments, field observations, and monitoring of community participation during program activities.

The evaluation results showed that community participation significantly increased during program implementation. Most participants actively attended training sessions and engaged in practical recycling activities. The improvement in community involvement indicates that educational and training approaches were effective in encouraging public participation in environmental programs.

Table 1. Program Evaluation Indicators

No	Evaluation Indicator	Before Program	After Program	Improvement
1	Community participation rate	45%	80%	+35%
2	Knowledge of waste sorting	32%	85%	+53%
3	Recycling skill competency	25%	78%	+53%
4	Household waste sorting practice	30%	60%	+30%
5	Number of ecobricks produced	0 unit	120 units	Significant increase
6	Recycled handicraft products	0 unit	45 units	Significant increase

The data above indicate that the program successfully improved community participation and knowledge regarding waste management. The most significant improvement occurred in recycling skill competency, which increased by more than 50%. This result demonstrates that practical training combined with community mentoring is highly effective in improving community capacity in recycling activities. Furthermore, the

increase in household waste sorting practices shows positive behavioral change among participants. Although the percentage has not yet reached full community participation, the improvement reflects growing environmental awareness and commitment toward sustainable waste management. The production of ecobricks and handicraft products also indicates that the program has created new opportunities for waste-based economic activities.

The success of the community service program was measured based on several predetermined indicators, including knowledge improvement, community participation, and product sustainability. Knowledge improvement was evaluated through pre-test and post-test score comparison. The increase in average scores indicates that educational and training methods were effective in transferring knowledge and practical skills to participants. Community participation served as another important indicator of program success. High attendance levels during training sessions and active involvement in recycling activities demonstrate strong community acceptance of the program. Community enthusiasm is considered a key factor supporting the sustainability of environmental empowerment programs.

In addition, product sustainability and potential economic value were used as indicators of program effectiveness. The successful production of ecobricks and recycled handicrafts demonstrates that household waste can be transformed into useful and marketable products. This outcome supports the concept of circular economy by reducing waste while generating economic benefits for the community. From a behavioral perspective, the program encouraged positive changes in community attitudes toward waste management. Many participants began to separate organic and inorganic waste at the household level. The program also promoted collaborative environmental activities among community members, which strengthened social cohesion and environmental responsibility.

Economically, the recycling activities provided alternative income opportunities for several participants. Recycled handicraft products showed market potential, particularly for local craft markets and community exhibitions. The utilization of plastic waste as raw material reduced production costs and increased product competitiveness. These economic benefits demonstrate that community-based recycling programs can contribute to local economic development while supporting environmental sustainability. Environmentally, the program contributed to reducing plastic waste accumulation in residential areas. The conversion of plastic waste into ecobricks and handicraft products helped decrease the volume of waste disposed of through burning or open dumping. This environmental improvement supports village-level sustainability efforts and promotes cleaner and healthier living conditions for the community.

5. Challenges and Supporting Factors in Program Implementation

Despite the positive outcomes of the community service program, several challenges were identified during program implementation. These challenges primarily related to limited infrastructure, variations in community participation, and technical constraints in recycling activities. Understanding these challenges is essential to improve future program sustainability and effectiveness.

One of the main challenges encountered during the program was the limited availability of recycling equipment and supporting facilities. Most participants relied on simple household tools for waste processing, which sometimes slowed down production activities. The lack of specialized tools for plastic waste cutting and compaction also affected the

efficiency and quality of ecobrick production. Additionally, limited storage space for collected plastic waste occasionally created logistical difficulties in maintaining organized recycling processes.

Another challenge involved variations in community participation levels. Although overall participation increased significantly, some residents were still hesitant to consistently apply waste sorting practices at the household level. Several participants expressed difficulties in maintaining recycling routines due to daily household responsibilities and time constraints. This condition indicates that behavioral change in environmental management requires continuous education and long-term community engagement.

Technical challenges were also observed during the early stages of training implementation. Some participants experienced difficulties in understanding proper ecobrick compaction techniques and product finishing processes for recycled handicrafts. Inconsistent plastic density inside ecobricks initially resulted in variations in product durability. However, these technical challenges gradually decreased after additional training sessions and mentoring were conducted.

In addition to challenges, several supporting factors contributed significantly to the success of the program. Strong support from village authorities played an important role in facilitating program implementation. The village government assisted in providing training venues, mobilizing participants, and promoting environmental awareness campaigns within the community. Institutional support strengthened program legitimacy and encouraged broader community involvement.

Community enthusiasm and collaborative spirit also became key supporting factors in program success. Participants demonstrated strong willingness to learn new recycling skills and actively shared knowledge with other community members. Youth organizations contributed to waste collection activities and assisted in promoting recycling programs through social and community events. This collective participation strengthened social cohesion and increased program sustainability potential.

Furthermore, the availability of locally accessible plastic waste materials supported continuous recycling production. Household plastic packaging waste served as an abundant raw material source for ecobrick and handicraft production. The ease of obtaining raw materials reduced production costs and encouraged participants to continue recycling activities independently after the program completion.

Another important supporting factor was the integration of practical and participatory learning methods during training sessions. Hands-on training activities allowed participants to directly practice recycling techniques, which improved skill retention and confidence in applying waste management practices. Continuous mentoring and follow-up monitoring also helped participants overcome technical difficulties and maintain program implementation consistency.

The identification of both challenges and supporting factors provides valuable insights for future community service programs. Addressing infrastructure limitations, strengthening continuous education programs, and improving technical training modules are recommended to enhance program effectiveness. Strengthening collaboration between community members, local authorities, and educational institutions is also essential to ensure long-term sustainability of community-based waste management programs.

Conclusion and Recommendations

1. Conclusion

The community service program focusing on optimizing household waste processing through education and recycling training programs has demonstrated significant positive outcomes in Kekeri Village, West Lombok Regency. The program successfully increased community awareness and participation in household waste management practices. Educational interventions combined with practical recycling training proved effective in improving community knowledge, technical skills, and environmental responsibility.

The results indicate that participatory community empowerment approaches play an essential role in strengthening sustainable waste management behavior. The increase in knowledge and recycling competency among participants aligns with the concept of community-based waste management, which emphasizes active community involvement as a key factor in environmental sustainability (Wilson et al., 2020). The improvement in waste sorting practices at the household level reflects behavioral changes that contribute to reducing environmental pollution and improving public health conditions.

Furthermore, the production of ecobricks and recycled handicraft products demonstrates that household plastic waste can be transformed into economically valuable products. This finding supports the circular economy approach, which promotes waste utilization as a resource for economic development while reducing environmental degradation (Singh & Sharma, 2021). The program also strengthened community social cohesion through collaborative environmental activities, which is considered an important element in sustainable rural development.

The program outcomes also confirm that educational and skill-based training programs can effectively enhance community capacity in environmental management. The integration of participatory learning methods and continuous mentoring contributed to long-term behavioral change and program sustainability. These findings are consistent with global waste management strategies that highlight the importance of local community engagement in reducing waste generation and improving recycling rates (Kaza et al., 2018).

2. Recommendations

Based on the program implementation results, several recommendations can be proposed to strengthen future community-based waste management programs. First, local governments are encouraged to develop supportive environmental policies that promote household waste sorting and recycling activities. Policy support can include the establishment of village-level waste management regulations, provision of recycling facilities, and integration of community recycling programs into village development planning.

Second, continuous educational programs and technical training should be conducted to maintain community awareness and recycling competency. Long-term environmental education initiatives are necessary to ensure consistent behavioral change and sustainability of waste management practices. Collaboration between universities, local governments, and community organizations is recommended to provide regular training and technical assistance for community members.

Third, the development of marketing strategies for recycled products should be prioritized to strengthen community economic empowerment. Local governments and community groups can collaborate to create product branding, promote recycled products through local markets and digital platforms, and facilitate access to broader marketing networks. The economic utilization of recycled waste products can increase community income and encourage long-term program sustainability.

Fourth, the provision of adequate recycling infrastructure and equipment is necessary to improve production efficiency and product quality. The availability of appropriate tools and storage facilities will support consistent recycling activities and reduce technical barriers experienced by community participants.

Finally, further research and community service programs are recommended to expand waste management innovations, particularly in integrating organic waste processing and advanced recycling technologies. Expanding program coverage to other rural communities may contribute to broader environmental sustainability efforts and support national waste reduction targets established by environmental authorities.

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