

Waste Composting as an Effort to Realize Kelusa, Payangan, Gianyar-Bali Village as an Ecotourism Village

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A B S T R A C T

Community service carried out in Kelusa Village, Payangan, Gianyar, Bali aims to help the community in improving knowledge and skills in waste management. Village waste management is important to realize Kelusa Village as an ecotourism village. The methods used are observation, interviews, counseling, and plot demonstrations. Based on the results of interviews with 18 participants in composting training and demonstration plots, it was found that the villagers were not used to sorting garbage because they were lazy and did not have time. The residents of Kelusa Village have also never done composting because they don't know how to compost. After the training, the villagers wanted to make compost, because they already knew the method of composting.

INTRODUCTION

The increase in population has caused centralized waste management efforts to no longer be adequate. Waste processing and utilization strategies are alternative solutions in building the responsibility of waste producers to be responsible for the waste produced (Jouhara et al., 2017). Waste management rules and processing technology that exist so far have not been able to handle the increasing waste production (Macrae, 2012). Disposing of waste into landfills is often the final solution that contributes to the production of methane gas emissions and also shortens the utilization life of landfills (Winahyu et al., 2013). One of the waste products is sourced from households with low average incomes tend to produce more waste than middle or high-income households (Karim & Nawshin, 2014). Generally, the composition of household waste is the type of organic and inorganic waste. The organic type consists of leaves, food waste, fruit waste, and wood. Inorganic types include plastic, paper, metal, rubber, styrofoam, and fabric (Sseptiningtiyas et al., 2018). Household waste production in residential areas reaches an average of 0.271 kg/person/day (Ratya, 2017).

Waste management at the household level requires innovation so that it can have a positive effect on society (Hayat & Zayadi, 2018). The processing of waste into compost is a commonly recommended way of managing household waste. Composting has so far been considered to be one of the solutions to dealing with the problem of organic waste. The method of processing into compost is considered the most economical and efficient way compared to other methods (Maskey & Singh, 2017). Processing waste is not limited to reducing its amount but can produce products that have economic value and can also produce safe and low-emission energy (Karim & Nawshin, 2014). Waste management through reuse, recycling, and reuse are simple techniques that can be done to reduce disposal to landfills (Sarbasov et al., 2019). Efforts to process waste into value-added products in addition to being potentially profitable also create a clean environment (Hemalatha & Visantini, 2020).

Household waste management is one of the models of the application of a circular economy that can be implemented in residential areas, especially in urban areas (Purwanto & Prasetio, 2021). The circular economy offers the concept of a path to sustainable growth, good health, and decent work while saving the environment and its natural resources (World Health Organization, 2018). A circular economy is a concept that is part of the implementation of sustainable development (Banaite & Tamošiuniene, 2016). The implementation of a circular economy is a new model to build responsible economic growth, where products and materials are recycled, repaired, and reused and waste from one industrial process becomes a valuable input into another (Preston et al., 2019). Waste management in the frame of the circular economy vision is important in efforts to shift the paradigm from a linear economic model to a circular economy model (Hemidat et al., 2022). The shift to a circular economy is a challenge. It is important to know the circularity and sustainability, due to the two different segments. So, a circular economy can only be achieved in a long-term perspective (Di Vaio et al., 2022). Several studies state that the potential of the circular economy has been mostly carried out in high-income countries, in contrast to

low- and middle-income countries that have diverse challenges when developing a circular economy (Ddiba et al., 2022).

Bali as an international tourist destination until now is also still facing problems in waste management (Muliarta et al., 2022). Even clean from waste is one of the 7 points of Sapta Pesona or conditions that must be realized to attract tourists to an area or region in Indonesia. The seven points are contained in the Ministerial Decree Pariwisata, Post dan Telekomunikasi Number.5 / UM.209 / MPPT-89 tentang Pedoman Penyelenggaraan Sapta Pesona (Sunarti & Hakim, 2017). Ecotourism is a special form of tourism that aims to preserve and protect natural and cultural resources but also contributes to the welfare of local communities (Tešin et al., 2020). The principle of ecotourism must be implemented to achieve sustainable tourism goals. One of the principles of ecotourism is to minimize the negative impact of tourism activities through waste management (Sekarningrum, 2020). Ecotourism has been widely implemented in various regions in Indonesia as a platform that contributes to emission reduction (Choi et al., 2020). Considering that so far tourism has become the fastest-growing industry in the world which contributes significantly to the increase in carbon dioxide emissions (Paramati et al., 2017).

The concept of ecotourism is the answer to management that prioritizes the involvement of local communities and is no longer centralized (Oktami et al., 2018). The participation of local communities, one of which is in waste management at the household level, is important, but on the other hand, the government is obliged to provide facilities and infrastructure for waste transportation (Assa & Wibisono, 2020). Kelusa Village, Payangan District, Gianyar-Bali is one of the villages that in its development want to realize an ecotourism village. The village with an area of 6.50 km² with a population of 4777 people, is now facing problems in waste management. The village is divided into 6 banjar (Banjar Dinas Ayah, Banjar Dinas Tri Wangsa, Banjar Dinas Roban, Banjar Dinas Peliatan, Banjar Dinas Keliki Kawan, and Banjar Dinas Yeh Tengah) its residents mostly throw household waste produced into moor (agricultural land). Waste that is thrown into the moor is expected to rot in the future and become fertilizer for plants.

Since 2022, Kelusa Village has received assistance from the reuse, reduce, and recycle (3R) waste processing site. Unfortunately, it has not been operationalized because it does not yet have human resources who have expertise in waste management. Based on this reason, service activities were then carried out with a focus on conducting waste composting training. This community service activity involving village administrators and waste management workers has the objective, namely: increasing community knowledge in composting waste. Future partners are expected to be able to compost waste and be able to socialize on how to compost waste at the household level. In general, waste management in households began to develop so that the concept of zero waste was implemented starting from the household level.

IMPLEMENTATION AND METHODS

Community service activities are carried out in Kelusa Village, Payangan, Gianyar -Bali. The intended result is an increase in partner skills in processing waste into compost. Participants can understand and carry out the process of composting waste simply. To realize this, the provision of waste composting techniques is carried out quickly, practically, and cheaply. Composting is one way to reduce garbage piles and maintain the cleanliness of the Kelusa Village area which is now trying to become an ecotourism village. Waste management into compost at the village level is also a step to implement the concept of zero waste starting from the household level in rural areas. The implementation of this community service activity uses observation methods, interviews, counseling, and plot demonstrations. Mentoring activities are carried out from the end of January to the beginning of March 2023. The composting method socialized in this service activity focuses more on aerobic composting, arguing that it is in line with efforts to reduce greenhouse gas emissions, especially methane gas.

Observation

Observations were made to find out the daily life of Kelusa village residents in managing the waste produced. Observations were also made to obtain the reasons underlying the actions of villagers in carrying out waste management at the household level. According to Ekka (2021), observation is a way that researchers use to collect data. This way allows researchers to use the senses, and their reflexivity as instruments to obtain information and know the social phenomena that occur. The method of observation allows researchers to understand the actions, roles, and behaviors of people (Walshe et al., 2012). The results of the observations allow it to be integrated as additional data or the results of confirmatory studies. This strategy is an additional means to corroborate research findings (Jamshed, 2014). Its results contribute to the theoretical and conceptual development as well as the explanation of social processes in palliative care. In particular, contributions to understanding structure (Walshe et al., 2012).

Interview

The interview technique is used to dig up more in-depth information about the habits of the residents of Kelusa Village in managing waste. There are 5 basic questions asked, including those related to the habit of sorting household waste, processing it into compost, and the challenges of composting. The interview involved 18 residents who were participants in counseling and demonstrations. The interview process becomes a way to collect data in qualitative research to direct participants in responding to certain research questions (Stuckey, 2013). The duration of time required in collecting, preparing, and analyzing data is often quite short. Interviews can be very rewarding and generate powerful insights into complex situations (Bullock, 2016).

Extension

Counseling is carried out as an effort to provide knowledge related to waste management theory ranging from sorting waste to processing household waste into products of economic value. The counseling was held at the Kelusa Village Office on Saturday, February 4, 2023. Through counseling, villagers can understand that the waste produced is residual raw materials that can be reused, so that all materials can be utilized and implemented the concept of zero waste from the household level. According to Amanah (2017), the term counseling is generally equated with illumination, although it can be interpreted as a transfer of knowledge. Counseling is generally related to the science of human behavior as part of a social system.

Plot Demonstration

Plot demonstration activities are carried out to deepen the understanding of the community or participants after receiving theoretical counseling or training. Plot activities are a form of deepening the theory because the participants will know the treatment or actions in a waste composting experiment. The implementation of the plot is an effort to accelerate the adoption of waste composting techniques. According to Sseguya et al. (2021), the plot becomes an effective model to increase the adoption of better technologies. The plot also aims to motivate participants to implement it in daily practice.

Monitoring and evaluation

Monitoring and evaluation activities are carried out to ensure that the activity process runs as planned. Monitoring and evaluation are carried out starting from preparation, planning, and implementation. The results become valuable information that can be used as a guide in evaluating activities and changes for improvement in subsequent activities. Monitoring and evaluation activities are a benchmark for the achievement of community service activities.

RESULTS AND DISCUSSION

Kelusa Village is administratively part of the Payangan District, Gianyar Regency. The village with an area of 6.50 km² is an area that is still part of the Tourist Area (BPS Gianyar, 2016). The natural beauty of the village and the diversity of culture it has, caused Kelusa Village to be frequented by tourists. In its future development, Kelusa Village is targeted to become an ecotourism village. According to Indika and Vonika (2016), Ecotourism is a form of implementation of the concept of sustainable tourism used in the development of tourism villages. Nugroho et al. (2018) revealed that ecotourism development generally includes empowering local communities, developing infrastructure to meet environmental sustainability, building governance to gain positive experiences and welfare, integrating tourism promotion through product development and market segmentation, and interpreting and educating to offer cultural and environmental preservation education.

Awareness of waste sorting

In an effort towards ecotourism villages, Kelusa Village experienced problems in waste management, especially household waste. Based on interviews with 18 people who participated in the training and demonstration of composting plots, none of the residents carried out waste sorting in their homes. Residents reasoned that they did not sort waste because they were lazy and had no time. Sorting is not carried out because in one house residents only prepare one trash can. This is following the statement of Choon et al. (2017) which states that waste sorting habits are influenced by lifestyle factors, such as laziness to change and not having time. There is a parallel between a positive, pro-environment attitude and actual intentions and behaviors. Interventions become important to trigger habits and decisions in carrying out waste sorting (Árnadóttir et al., 2019). Knowledge in managing waste is an important factor for households in separating waste. Environmental concerns, waste management counseling, yard area, home ownership, income, building type, and education are other factors that influence behavior in waste management (Sabarinah, 2017). Success in waste sorting programs is related to awareness of the benefits of sorting, especially related to the need for a clean environment. Waste sorting will be increasingly in demand if there are financial rewards from stakeholders (Mugambe et al., 2022).

The residents of Kelusa Village on the other hand have not carried out sorting due to the limited availability of facilities and infrastructure at the household level. Households in Kelusa Village on average only have one garbage shelter, causing waste to tend to be mixed. The results of research in Uganda stated that the availability of supporting infrastructure greatly affects behavior in sorting waste (Mugambe et al., 2022). The behavior of sorting waste is greatly influenced by the intention to sort waste. Individual characteristics have a significant impact on waste sorting behavior, where female respondents, high levels of economic income, and middle age and the elderly are more willing to implement waste sorting behaviors (Liu et al., 2022). Waste sorting is an important step in waste management and recycling because there is an opportunity to reduce wasted resources (Sabiini & Rishmany, 2019). The place is a public facility in Kelusa Village and also only has one trash can to hold all types of garbage. The availability of one type of trash can is suspected to be the cause of the community not sorting garbage or mixing waste in one place. The case in several developing countries is that situational factors, such as physical conditions and incentives from the government, have a major influence on community participation in sorting household waste (Rousta et al., 2020). Lifestyle is also an influential factor in waste management, in addition to the provision of waste bins according to the type of waste contributes to the desire to sort waste (Choon et al., 2017).

Other inhibiting factors that reduce citizen participation in waste management include a lack of facilities, lack of training, and limited information dissemination (Limon & Villarino, 2020). Socialization of comprehensive and sustainable waste management to the community becomes a necessity and is followed by providing incentives and disincentives to communities that reduce and or manage household waste (Wulandari et al., 2021). There is an influence of external and internal factors in household waste management. External factors include low collection frequency, low cleaning services, and inadequate facilities. Internal factors are low awareness, lack of knowledge, and low responsibility for the waste produced (Srun and Kurisu 2019). The participation of the public and private sectors is needed in the implementation of relevant laws and policies on waste recycling to increase public awareness (Mugambe et al., 2022).

Perceptions of Kelusa Residents Regarding Waste Management

In terms of perceptions of waste management, 18 Kelusa village residents who were interviewed stated that it is important to sort and process household waste. Residents are also aware of the impact of not doing household waste management but do not have time to do so due to busyness factors. This condition has similarities with the results of a study in Nigeria which stated that most respondents had a positive attitude towards proper waste management, but bad practices of waste management. The government must create awareness through seminars, radio broadcasts, television, and social media to teach best practices in waste management (Oladejo & Amosu, 2020). Significant factors such as age, income, and level of education affect people's perceptions, practices, and attitudes toward waste management (Olukanni et al., 2020). Residents' perceptions of Home Waste Management tend to view the principle of recycling as the most efficient principle to overcome the waste problem (Wulandari et al., 2021).

The residents of Kelusa Village realize that they produce waste every day. Residents of Kelusa Village estimate that in one family they produce waste of around 3-5 kg/day or about 0.5-1.5 kg/person/day. Based on the amount of waste produced, it is estimated that 80% is organic waste and 20 percent is inorganic. The results of measuring the rate of household waste generation in one of the cities in Ghana averaged 0.82 kg/person/day (Nyankson et al., 2015). Households in North Minahasa City, North Sulawesi Province in a study were said to produce waste reaching 20.34 kg for seven days or around 2.91 kg/day (Wulandari et al., 2021). Residents of Dumai City, Riau Province in a study stated that it produces waste up to 0.31 kg/person/day (Hidayat et al., 2022). Meanwhile, countries with high GDP produce a larger amount of waste (around 1.5-2.7 kg/capita/day) with a lower organic waste composition of around 40% (Thabit et al., 2022).

Generally, the residents of Kelusa Village throw garbage into the moor, where the dumping into the moor is carried out assuming that the waste will later rot and fertilize the soil. The disposal of waste into the moor that is owned has been carried out in a down-to-day manner and has become the most practical way to solve the problem of household waste. Several studies have revealed that open disposal, burial, and burning have become common ways that people handle household waste (Adekola et al., 2021; Olukanni et al., 2020; Wulandari et al., 2021). The role of the community in waste management has not been satisfactory, because most residents feel that it is the responsibility of the government (Olukanni et al., 2020). Comprehensive and sustainable waste socialization needs to be given to the community and also followed by the provision of incentives and disincentives (Wulandari et al., 2021).

Indiscriminate waste disposal is an indicator of a low level of awareness, so efforts are needed to promote sustainable mitigation and adaptation of waste management. Waste management policies starting in households are also strengthened through working groups, community involvement, and local authorities (Adekola et al., 2021). Households on the other hand are also invited to be involved in being responsible for the waste produced. Education on efficient waste disposal practices to reduce disruption to health becomes a necessity (Nwachukwu et al., 2018).

Composting of household waste

It was recorded that of the 18 people who participated in composting training and demonstrations, they admitted that they had never done household waste composting. Residents generally admit that they do not know how to do composting because they have never received training in composting household waste. The same condition also occurs in Syria, where based on research the people there do not know how to process household waste into compost. Composting household waste in addition to reducing the volume of waste also saves the cost of collecting, moving, and disposing of solid waste (Saghir, 2021). The special case for waste management among Indonesians is hampered by the lack of public understanding of waste management (Susilo et al., 2021). Another reason for the residents of Kelusa Village not to compost is the limited time, place, and equipment (Figure 1). Limited time because in addition to work, the residents of Kelusa Village are also involved in traditional and cultural activities.

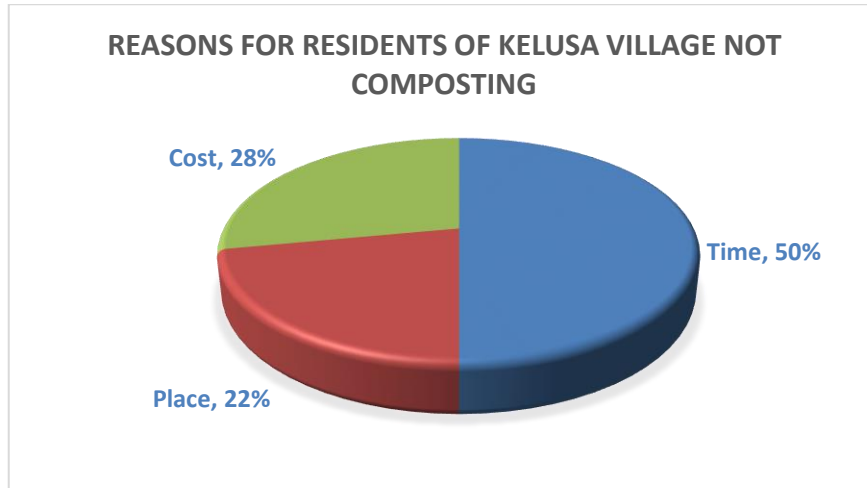


Figure 1. The reason why the residents of Kelusa Village do not compost

To attract the interest of the residents of Kelusa Village to compost household waste, during the demonstration the plot was given a composting method using used materials at home, such as using buckets or burlap sacks as a composting place. The use of used buckets and burlap sacks is a simple alternative, so it does not require a special place and can be stored in one corner of the yard. The hope is that the public can understand that the process of composting household waste does not require a special place and can be done simply. The composting method given during the plot demonstration is the aerobic composting method (Figure 2). This method is given to provide understanding to the community so that when choosing composting, pay attention to the impact of methane gas emissions from the composting process. Aerobic composting does not produce methane gas, since methane gas will contribute to global warming. If later methane gas will be used as fuel, the composting method chosen is the anaerobic method.



Figure 2. Demonstration of the plot of composting household waste

The composting process delivered to the people of Kelusa Village is also without the addition of a commercial decomposer. The decomposer used in composting is to utilize natural decomposers such as manure or use soil as a decomposer. The use of a natural decomposer is recommended to avoid incurring costs in the composting process due to the purchase of a commercial

decomposer. To speed up the composting process, residents participating in the composting are reminded to maintain temperature, pH, and humidity during composting. The compost material is turned over once every 7 days to help the aeration process. After 4-5 weeks the compost can be harvested and the compost is declared ripe with a characteristic earthy smell, blackish-brown color, and crumbs.

Waste composting and circular economy

Composting household waste can be one way to manage organic waste produced by households. In addition, composting can also help create a circular economy. If the composting process can be carried out sustainably by the residents of Kelusa Maha Village, it will also indirectly create jobs, because composting waste can be used as a micro or small business that can be managed by the local community. This can help reduce unemployment and increase people's economic independence. According to Sulewski et al (2021), the management of household waste into compost has a positive economic and environmental impact. The problem is that the promotion of home-level composting requires active support from local governments, both in the financial dimension and by increasing the environmental awareness of residents. Composting is an alternative form of organic waste management that is more environmentally friendly and cost-effective and turns into organic fertilizer (Sokač et al., 2022). So far, people have not realized that composting has the potential for additional benefits that can increase household income. The task of stakeholders is to educate rural communities about composting, by conveying the benefits of composting activities that can provide a side income through the adoption of composting practices (Salleh et al., 2022). Composting efforts not only contribute economically and socially but more important ecological benefits to preserve the environment and minimize pollution (De Boni et al., 2022).

Composting is the most sustainable way of waste management, where composting becomes an effort to use raw materials more rationally while reducing the amount of waste produced (Sulewski et al., 2021). Making maximum use of waste indirectly avoids resource depletion and improves the quality of life for the community (Hoa & Khanh, 2021)(Hoa & Khanh, 2021). Building citizen awareness is essential in promoting the circular economy model, which is one way to reduce resource consumption to realize sustainable development (Sulewski et al., 2021). The circular economy strategy will provide additional waste treatment methods for waste management and increase the value of by-products (Li et al., 2016). The implementation of the circular economy concept can save the use of natural resources up to four times the use of resources taken annually on the grounds of supporting economic growth. This concept provides an affirmation that the circularity of economic systems must be approached from a systemic perspective that includes production and consumption as well as waste management (Bianchi & Cordella, 2023).

The concept of a circular economy is a vital driver in the sustainable use of natural resources, to achieve the 2030 agenda for sustainable development goals. A move to a circular economy can maintain the value of resources and products at a high level and minimize waste production; (Khajuria et al., 2022). The implementation of the circular economy concept can be seen as a closed-loop system, where resource inputs, waste, emissions, and energy leaks are minimized. Consistent implementation of circular economics requires a holistic approach (Schützenhofer et al., 2022). The circular economy seems to be a promising concept, as it has been able to attract the business community to work in sustainable development (Korhonen et al., 2018). The concept of 3R in a circular economy is to reduce, reuse, and recycle materials. The principle describes a circular system in which all materials are recycled, all energy comes from renewable energy; activities support and rebuild ecosystems and support healthy human health, and communities and resources are used to generate value (Heshmati, 2017). In addition, the circular economy strategy is aligned with the goals of climate change and is a means to address the problem of climate change (Li et al., 2016).

Monitoring dan evaluasi kegiatan

The monitoring and evaluation process is carried out from the beginning of the activity to the end to find out the response and changes from partners. Monitoring and evaluation activities aim to see changes in the knowledge and behavior of villagers who are participants in processing waste into compost. Through monitoring and evaluation, it is also to ensure the commitment of Kelusa Village residents to process household waste, so that the concept of zero waste is implemented at the household level (Table 1).

Table 1. Partner response

Response	Before counseling and demonstration of plots	After counseling and demonstration of the plot
Waste sorting	The villagers have no one to sort the waste and are used to throwing the waste into the moor and burning the waste produced	There is a desire to sort waste through the provision of waste bins according to the type of waste in each household
Motivation for composting waste	Not doing composting because you don't know the composting method.	Motivated to do composting because it knows the ways and benefits of composting
Perception of waste composting	Difficult takes a long time, requires additional costs, and requires a special place	Composting can be done simply, quickly, and with practice and does not need a special place.

Service activities carried out in Kelusa Village as a whole provide a change of view and provide knowledge for villagers in managing the waste produced. It is hoped that the participants of counseling and composting demonstrations can transmit the knowledge gained to other villagers. Sustainable management of household waste will later be the beginning of the application of the zero waste concept at the household level. The implementation of the zero concepts will help

efforts to realize Kelusa Village as an ecotourism village that always pays attention to ecological sustainability.

CONCLUSIONS

Residents of Kelusa Village do not yet have the habit of sorting waste and composting household waste as a form of source-based waste management action. Residents have not sorted garbage because they are lazy and have limited time due to busy work. The next reason is that the villagers have not yet sorted out, because each household only provides one trash can and no one has provided a trash can based on the type of waste. The processing of household waste into compost has also not been carried out by the residents of Kelusa Village because they do not know how to compost household waste. Based on the results of the interview, it was revealed that other reasons that caused residents to have not composted it, including limited time, place, and limited composting costs. Even though the composting process can be done quickly, practically, cheaply, and produce quality compost. Residents of Kelusa Village after receiving counseling and training through the plot demonstration method have the desire to process household waste into compost. Residents hope that there will be continuous assistance until they understand and can compost well. The desire of the villagers to compost was triggered by the enthusiasm to realize Kelusa Village as an ecotourism village. Residents also want to avoid piles of garbage in the moor that can trigger environmental pollution and health problems for the surrounding community.

RECOMMENDATIONS

The village, regency/city, and provincial governments of Bali should conduct composting counseling and training for all villages in Bali, to minimize the waste problem. The Bali Provincial Government must also provide incentives for villages that are committed and able to carry out waste management properly. This community service activity is only limited to providing knowledge and skills in processing waste into compost, while waste can be processed into a variety of products of economic value. In the future, it is also necessary to conduct training and demonstrate the plot of processing waste into liquid organic fertilizer, utilization of waste for maggot cultivation, and processing waste into eco-enzymes. The processing and utilization of inorganic waste into products of economic value are also important so that rural communities can implement the concept of zero waste.

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