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Women's Involvement in the Implementation of Source-Based Waste Management through Composting Method in Batuan Village, Gianyar-Bali

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A B S T R A C T

Community service activities carried out in Batuan Village, Sukawati, Gianyar-Bali aim to improve the knowledge and skills of housewives in household waste management. Housewives have been leaders in waste management at the household level. The methods used include observation, interviews, socialization, and plot demonstration. Based on the results of interviews with 15 participants in composting training and plot demonstrations, it was found that 13% of housewives had routinely composted and 87% percent had never done composting, citing not knowing how to compost, not having a place for composting and reasons for time constraints. Housewives in Batuan Village after receiving socialization and training have a commitment to sorting waste and composting.

INTRODUCTION

The increase in activity by tourism and urbanization activities that occur in Bali causes an increase in waste generation. Limited waste management and land availability have become obstacles to the fulfillment of sustainable development goals and National Policy (Widyarsana et al., 2020). The problem is getting more difficult because people at the village level are not used to sorting waste because they are lazy and do not have time. Another reason is that people at the village level claim not to know how to make compost (Muliarta, Ketut, et al., 2023). Bali with around 4.2 million inhabitants and 4.9 million tourists annually produces waste reaching 822,555 tons/year, which is dominated by organic waste around 65%, and plastic waste around 15.67%. The lack of integrated waste management causes around 283,369 tons/year (34.45%) of waste to be dumped into the environment illegally (Widyarsana et al., 2020).

Efforts to build a waste management system are carried out by the Bali Provincial Government through Bali Governor Regulation Number 47 of 2019 concerning Source-Based Waste Management. The implementation of this regulation in principle stipulates that every household and the like are obliged to carry out source-based waste management, namely reducing, sorting, processing, and utilizing waste according to their respective abilities and creativity. Governor Regulation Number 47 of 2019 is followed up by Bali Governor Decree Number 381/03-P/HK/2021 of 2021 concerning Guidelines for Source-Based Waste Management in Villages/Villages and Customary Villages. It is hoped that waste management starts from the household level, as well as an effort to implement the concept of zero waste from households. Agustina and Hidayat (2013) stated that the concept of zero waste is more about a strategy for managing waste so that nothing is wasted and causes environmental pollution. Meanwhile, Guerrero et al. (2022) stated that zero waste is an approach developed to conserve a limited amount of available resources.

Source-based waste management policy if understood is a step to encourage the community to apply the concept of circular economy, by converting the waste produced into products of economic value. The community can optimize the use of materials and break down costs by utilizing the waste produced into a valuable product. According to Preston et al. (2019), a circular economy is an economy in which products and materials are recycled, repaired, and reused rather than disposed of, and where waste from one industrial process becomes a valuable input into another process. A new vision of how waste management systems can be transformed into a circular economy is needed, for a paradigm shift from a linear economy model to a circular economy model (Hemidat et al., 2022).

Household waste is a major source of garbage accumulation in every country. It is important to identify the role of women in assisting in competent waste handling at the household level (Srivastava, 2021). Moreover, more than 95% of sweeping is responsible for cooking and food preparation activities that contribute to the increase in the amount of waste (Gani et al., 2012). Women, on the other hand, are responsible for the waste management process in the household (Srivastava, 2021). Women play a big role in waste management, starting from the sorting process, and maintaining the cleanliness of the house to waste disposal. The involvement of women in waste management policy-making will help increase effectiveness in its implementation (Nwamaka et al., 2021). Women can become social capital in the community with the ability to mobilize the community through their active role in waste management activities (Asteria & Herdiansyah, 2022).

Women can be used as role models in welfare empowerment programs and can have a significant impact on waste management (Asteria & Herdiansyah, 2022). Women through the Family Welfare Empowerment (FWE) organization have an important role in improving the quality of life in the community. FWE in motivating villagers and improves their quality of life through business opportunities (Muang et al., 2021). FWE is one of the organizations that work at the civil society level in improving family welfare and is more effective because of the reach of cadres up to the village level (Wiendijarti et al., 2020). Women can raise the economic status of low-income families by utilizing their social capital stock in the form of social networks in the social environment (Achmad et al., 2022). FWE currently still survives and exists as a women's empowerment organization (Wiendijarti et al., 2020). FWE can socialize organic waste processing skills to the community (Putri & Susanna, 2019).

The FWE Driving Team in Batuan Village, Sukawati, Gianyar-Bali is one of the FWE organizations in Bali that has the desire to take a role in waste management starting from the household level. Members of the Batuan Village FWE Mobilization Team target to be able to improve their composting capabilities. This step is an effort to implement Bali Governor Regulation Number 47 of 2019 concerning Source-Based Waste Management. According to the needs of partners, composting introduction training was carried out, followed by demonstration plots.

IMPLEMENTATION AND METHODS

Community service activities are carried out by involving FWE Desa Batuan, Sukawati, Gianyar-Bali. The result to be achieved is an increase in the knowledge and skills of partners, especially housewives in managing waste and composting. FWE members involved have the understanding and ability to carry out the waste composting process simply and at a low cost. To achieve this target, household waste composting techniques are provided quickly, practically, and cheaply. The composting process is an alternative way to reduce piles of waste at the household level. Waste management efforts starting from the household level are also steps to implement the concept of zero waste starting from the household level.

The method used in the implementation of community service activities uses observation, interview, counseling, and plot demonstration methods. The mentoring activities will be carried out from the end of February to the beginning of May 2023. The composting technique socialized to participants in this service activity focuses more on aerobic composting, because it is easy to do with simple equipment and in line with greenhouse gas emission reduction policies, especially methane gas.

Observation

The observation method was carried out to determine the habits of FWE mothers in Batuan Village in managing the waste produced. Observation is a technique to uncover the reasons underlying the actions of mothers to manage waste generated in the household. Ekka (2021) stated that observation is a technique for researchers an effort to collect data. This technique allows researchers to use the senses, and reflexivity as a benchmark to obtain information and know social phenomena that occur. Observation provides researchers with opportunities to understand people's actions, roles, and behaviors (Walshe et al., 2012). Observational results can be integrated as additional data or confirmatory study results. This strategy is another way to corroborate research findings (Jamshed, 2014). The results contribute to the theoretical and conceptual development and explanation of social processes in palliative care. In particular, it helps to understand structure (Walshe et al., 2012).

Interview

The interview method was conducted to explore deeper information about the habits of PKK mothers in managing household waste. There were 9 questions asked, including related to household waste management habits, composting efforts, and challenges when composting. Interviews were conducted with 15 residents who were participants in counseling and demonstration plots. Interviews are one way to collect qualitative research data by directing respondents in response to certain research questions (Stuckey, 2013). The time it takes to collect, prepare, and analyze data is usually short. Interviews can be very useful and can yield powerful insights into complex situations (Bullock, 2016).

Extension

The method of counseling or socialization is carried out as a way to transfer knowledge related to waste management theory, starting from sorting waste to processing household waste into compost. The counseling will be held at the 3R Temporary Processing Site in Batuan Village on Saturday, May 6, 2023. Through counseling, partners understand that the waste produced is the remaining raw materials that can be reused so that all materials can be utilized and apply the concept of zero waste from the household level. Amanah (2017) revealed that the term counseling is often synonymous with delivering information, although it can be interpreted as a transfer of knowledge. Counseling is often associated with the science of human behavior as part of a social system.

Plot Demonstration

The implementation of plot demonstrations is intended to deepen the understanding of partners after counseling or theoretical training. This activity is a form of theoretical deepening because participants will learn about the process or action in the waste composting experiment. This strategy was implemented to accelerate the adoption of waste composting technology. According to Sseguya et al. (2021), plot demonstrations are an effective model for increasing better technology adoption. Demonstrations are also designed to motivate partners to do so in daily practice.

Monitoring and evaluation

Carry out monitoring and evaluation activities to ensure that activities run according to plan. Monitoring and evaluation begin with preparation, planning, and implementation. The results become valuable information that can be used as a guideline to evaluate activities and make changes for further improvement of activities. Monitoring and evaluation activities are the baseline for the achievement of the activities carried out.

RESULTS AND DISCUSSION

The community partnership activity carried out in Batuan Village, Gianyar involved 15 female participants who are members of FWE Batuan Village. The participants involved were about 47% aged between 41-50 years, 33% aged 51-60 years, and the remaining 20% aged between 31-40 years. It is estimated that age maturity is very influential on the commitment and willingness to carry out household waste management. This is in line with the results of a suburban study in South Africa which states that women aged 31 to 50 years have a higher commitment to managing household waste (Lange et al., 2022). Other studies have also mentioned that age and gender influence the success of waste management programs. Women and the elderly have better waste management compared to men and younger people (Nepal et al., 2023).

Participants involved in the partnership program are mostly or about 67% high school graduates, 15% junior high school graduates, and only 13% undergraduates. This level of education affects the knowledge of the participants in managing waste generated in the household. This view is in line with the statement of Handayani et al (2018) which states that education and knowledge play an important role because the level of education can affect the success of waste management awareness programs. The level of education correlates with the ability to adapt technology, especially waste management technology (Asteria & Haryanto, 2021).

The employment of the participants of the partnership program in Batuan Village is 67% housewives, only 13% are private employees and 20% are entrepreneurs. Based on the results of interviews, women who are only housewives include taking an important role in waste management. Waste management starts from the process of collection, storage to waste disposal. This is in line with Hadiningrat's opinion (2020) which states that women in Indonesia are not only in charge of managing households but also in charge of managing household waste. The provision of information on waste management is quite significant in increasing the level of women's participation in waste management (Chukwuone et al., 2022). Women's activities in the surrounding environment affect household and community waste management. Women who are actively involved in women's community organization activities have more ability to reduce the amount of waste generated from home (Hadiningrat, 2020).

Behavior and Awareness in Waste Sorting

Housewives in the village assisted on average 33% of them had routinely sorted household waste, and 40% admitted to occasionally sorting waste (Figure 1). Housewives who have never done household waste sorting generally reason because of the busy factor and limited time they have. The percentage of housewives who carry out waste sorting in Aid Village is better, compared to the awareness of men in Kelusa Village, Gianyar who have not yet carried out household waste sorting (Muliarta et al., 2023). Women are generally found to be more environmentally conscious than men. The location of the residence is also influential, where people living in regional housing have a relatively higher awareness of the environment (Givano & Ismail, 2020). One of the habits of sorting waste is influenced by lifestyle factors, such as laziness to change and not having time due to busy work (Choon et al., 2017).

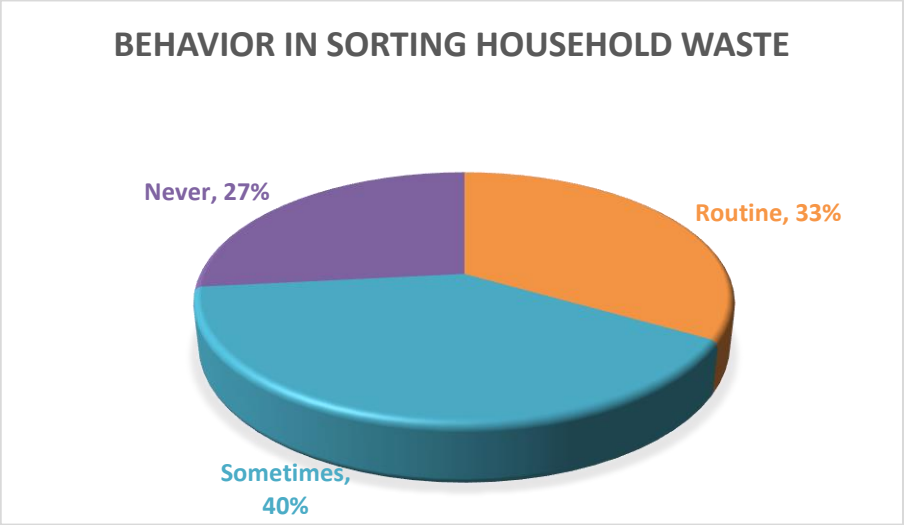

Figure 1. Behavior in sorting household waste by women in Batuan Village, Sukawati-Gianyar

The limited number of trash cans in the household is the reason for housewives sorting waste, so it tends to be mixed. Housewives who sometimes do separate tend to be due to disappointment factors, where the waste that has been sorted during the transportation is again mixed. This condition shows that the availability of different trash cans according to the type of waste and transportation method affects the willingness to sort waste. According to Mugambe et al. (2022), the availability of supporting facilities and infrastructure greatly affects the behavior and willingness to sort waste. Gender, in this case, women have a better level of willingness to implement waste sorting behavior. Economic income and age, especially parents, have more awareness of sorting waste in households (Liu et al., 2022). Sorting efforts from the household level is the first step in waste management and recycling to reduce wasted resources (Sabiini & Rishmany, 2019).

Housewives in Desa Bantuan hope for more regular socialization to increase understanding and knowledge in managing and processing household waste. According to Limon & Villarino (2020), limited information is one of the obstacles that reduce citizen participation in managing the waste produced. The availability of adequate information and periodic socialization are the needs of the community. Providing incentives and disincentives to communities that reduce and or manage household waste will be a way in realizing sustainable waste management (Wulandari et al., 2021).

Housewives in Batuan Village generally stated that waste sorting is very important. Moreover, the Bali Provincial government has issued a source-based waste management policy. Housewives in Batuan Village want to be involved in source-based waste management, even though it is from the household level. According to Asmara et al (2020), women play a more important role in sorting waste and recycling plastic waste into handicraft products. Men play a role in transporting and processing plastic waste into plastic raw materials of economic value. Donacho et al (2023) revealed that women are around 88% more likely to sort waste in the household compared to men. Women in the household are the main decision-makers in the household responsible for the waste of family disposal practices (Patel et al., 2018). Waste management starting from households as a source of waste can have an economic impact in the form of side income as additional income for the family (Malik et al., 2018).

Potential Household Waste

Based on the results of interviews with Batuan Village mothers, it was estimated that the amount of waste produced reached 3-5 kg/day/family. The amount of waste produced is estimated to be around more than 80 percent of organic waste that can be processed into compost. The production of waste produced by one family in Aid Village is almost the same as the waste produced by one family in North Minahasa City, North Sulawesi which reaches 20.34 kg for seven days or around 2.91 kg/day (Wulandari et al., 2021). Especially for 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).

The amount of waste generated by households in Batuan Village is strongly influenced by behavior in managing waste and awareness to recycle. Waste production is also influenced by lifestyle factors, especially the level of household spending and consumption. This is in line with the views of Eshete et al. (2023) which state that the majority of households have bad habits, such as throwing garbage into the backyard, on the side of the road, in sewers, and burning garbage. The behavior of waste sorting at the household level, especially in Indonesia, is only 9% and is the reason for the enactment of government policies on recycling programs through waste banks, which unfortunately only 30% run regularly (Sabarinah, 2017). The amount of waste recycled is still low due to a lack of awareness on how to sort household waste (Zakianis et al., 2018). Household behavior in managing waste is influenced by their socio-economic characteristics. The income level also positively affects household waste management behavior (Handayani et al., 2018). In contrast to age, gender, race, and education factors do not have a significant effect on waste sorting (Otitoju & Seng, 2014).

Housewives in Batuan Village, Gianyar-Bali admitted that they had not received socialization or training on household waste management, even though the Bali Provincial Government had stipulated Bali Governor Regulation Number 47 of 2019 concerning Source-Based Waste Management. They have an interest in attending training to improve their skills in managing household waste. According to the results of the study, empowerment activities are key in building awareness and capacity of individual household waste managers, especially for women as the main actors (Asteria & Haryanto, 2021). Training on household solid waste management and recycling waste management is statistically significantly correlated with household solid waste management (Limache, 2021; Sultana et al., 2021). Separation of waste starting from the source is a basic prerequisite in waste management. This step will be effective if the government makes arrangements so that the process runs sustainably (Nepal et al., 2023).

Awareness of Composting Household Waste

It was recorded that 13% of women who are housewives in Batuan Village have routinely composted and 87% percent have never done composting. Housewives who regularly do composting admit to feeling the benefits of composting efforts, both in terms of environmental and economic benefits. This condition is in line with the opinion of Farhidi et al. (2022) which states that composting is one of the environmentally friendly ways to reduce organic waste. It is economically viable because it reduces the costs associated with transporting garbage. Household waste such as fruit and vegetable skins and food waste can be composted at a low cost and produce nutrient-rich compost products that benefit plants (Patel et al., 2018). So the intention and awareness of composting are strongly influenced by attitudes, subjective norms, and perceived behavioral control (Rahman et al., 2022).

Based on the results of interviews and observations from 13% of housewives who routinely compost in Batuan Village because they have received composting training, some have attended the training once and some twice. Another 93% have never attended composting training due to busy factors and limited access to training. According to Ridwan et al. (2014), increasing knowledge of making compost from household organic waste will increase public awareness to be actively involved in waste management. A special case for waste management among Indonesians is hampered by the lack of public understanding of waste management (Susilo et al., 2021).

The practice of composting has not been carried out by housewives in Batuan Village generally because they do not know how to compost. Other reasons are due to limited time and not having a place to do composting. Generally, the practice of composting at the household level is still low, as an example of the case as is also the case in Uganda (Nsimbe et al., 2018). Composting practices at the household level are low because the average does not know how to make compost and lacks socialization in composting (Muliarta et al., 2023). The willingness to do composting is also influenced by the availability of composting places and the need to do composting. The long duration of composting time is also one of the challenges that cause residents to not compost (Ayilara et al., 2020).

The composting practice offered when conducting plot demonstrations is composting using equipment around the house, one of which is using rice sacks as a composting place. The use of rice sacks is an effort to provide an understanding that composting does not require a special place and can be done simply and practically. The composting method introduced is the aerobic method so the composting process carried out is in line with efforts to reduce greenhouse gas emissions (Figure 2). However, the community is also still given an understanding that the anaerobic composting method is also good to do if it can utilize the methane gas produced as an alternative energy source.

Figure 2. Socialization and demonstration of household waste composting plot in Batuan Village

The practice of composting was introduced to housewives in Batuan Village also without the use of commercial decomposers. Participants were invited to compost using natural decomposers, such as cow dung, chicken, and other livestock manure. The use of natural decomposers is an effort to provide an understanding to the public that composting can be done cheaply. To convince participants that composting can be done cheaply, in the composting training it was also conveyed that the addition of sugar or sugar solution is not mandatory. The reason is that the addition of sugar only helps to speed up composting in the early stages, but does not give different compost results.

The aeration process introduced in the demonstration of the composting plot to participants is passive aeration. This step is also part of an effort to convince participants that the composting process can really be done at low cost or even at no cost. Passive aeration is introduced more on the effort to turn the compost every 7 days to produce mature compost within 30-35 days. The composting process with an average duration of one month to convince participants the composting process can be done in a short time. This effort is to answer the views of participants who generally state that composting takes a long time, between 4 to 6 months.

In the final stage of the plot demonstration, participants were given an understanding of how to know that the compost made was mature. This simple way, first compost crumbs when held, second smells of earth and third is blackish-brown. This understanding is important so that participants can produce compost that is mature and ready to use. If the resulting compost is mature, it will be beneficial for plants and not interfere with plant growth.

Composting as an Application of Zero Waste Concept at the Household Level

Housewives in Batuan Village admit that composting helps in reducing the volume of household waste, but do not know if composting waste is part of efforts to implement the concept of zero waste at the household level. The concept of zero waste has been understood as a holistic waste management concept and has become a strategy for the use of existing resources (Hamid et al., 2020). The Zero Waste International Alliance defines zero waste as an ethical, economical, effective, and forward-thinking concept by encouraging people to change their lifestyles to mimic natural cycles, where all discarded materials are designed to be resources that can benefit others (Bogusz et al., 2021). The idea of zero waste is an efficient way to solve the waste problem. Zero waste is an effort to promote development according to the resource life cycle sequentially to reuse all products (Hamid et al., 2020).

Zero waste is an innovation from waste management that supports environmental security (Choiriyah, 2018). Waste in the zero waste concept can be used as compost which can then be used as organic fertilizer with a more balanced nutritional content (Halomoan, 2021). This is following the concept of zero waste which underlines the idea of the production process as a closed-loop system, given that the output of one process is used as input for other processes, converted into value-added production (Nurdiana et al., 2022). Awareness of waste management by the community and policies for providing incentives and disincentives are parameters in the implementation of zero waste. Zero waste must be integrated into local policies so that it is an obligation for the government and the community to implement it (Nizar et al., 2018). Zero waste is a very ambitious long-term goal because it is very difficult to minimize waste production and maximize the amount of waste that can be utilized for reuse (O'Malley et al., 2014).

Monitoring and Evaluation

Monitoring and evaluation activities have been carried out from the initial stage of the activity to the final stage to determine changes in knowledge and behavior from partners after receiving socialization and demonstration plots. Monitoring is also a way to ensure the commitment of housewives to managing household waste produced. The results of monitoring and evaluation will be a guideline for determining the success rate of activities by comparing initial conditions with post-activity (Table 1). The monitoring results can also be an evaluation material for the Batuan Village government and the Bali Provincial Government in improving the source-based waste management program.

Tabel 1. Partner response

Response	Before counseling and demonstration of plots	After counseling and demonstration of the plot
Waste sorting	It was recorded that 33% of housewives routinely sort household waste.	The number of housewives sorting waste has increased by more than 60%
Motivation for composting waste	About 13% of housewives do composting, the rest have not composted because you don't know composting method	The percentage of housewives who do composting increases, after knowing a practical and simple method of composting
Perception of waste composting	Housewives view composting requires a special place and a long time	The composting process can be done simply, taking about a month and can not require a special place

The service program carried out in Batuan Village, Sukawati, Gianyar in general has provided increased knowledge about waste management for housewives. Training participants are expected to be able to transmit the knowledge gained to other villagers. Waste composting at the household level can later give impetus to the implementation of source-based waste management policies. Housewives in Batuan Village can become leaders in popularizing composting efforts at the household level, so as to realize the implementation of the zero waste concept at the household level.

CONCLUSIONS AND RECOMMENDATIONS

Housewives in Batuan Village estimate that the amount of household waste produced in one day reaches 3-5 kg. However, only 33% of housewives in the village already have the habit of sorting waste regularly, the rest do not do separation because they only have one trash can. It was recorded that only 13% of housewives in Batuan Village had routinely composted and 87% percent had never done composting, for reasons of not knowing how to compost, not having a place for composting, and reasons for limited time. Housewives in Batuan Village after receiving socialization and training commit to sorting waste and composting. The number of housewives who do composting is increasing because they know the composting method that is practical, simple, easy, and does not require a special place. Awareness to do composting is also increasing because housewives in Batuan Village recognize that composting activities can be widespread in handling household waste and can be an additional source of income from composting activities. In the future, housewives of Batuan Village will continue to receive assistance, so that they can process household waste into other products, such as liquid organic fertilizer and eco-enzyme.

Recommend to the Bali Provincial Government and districts/cities in Bali to conduct socialization and training on household waste management, especially processing waste into compost for housewives. Socialization and training for housewives are important because housewives are leaders in waste management at the household level. This effort will be in line with the implementation of source-based waste management. This service activity is still limited to increasing community knowledge and skills in processing waste into compost. In the future, socialization, and training on processing household waste into other processed products are needed, such as liquid organic fertilizer, eco-enzyme, utilization of household waste as animal feed, and utilization of waste for magot cultivation.

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