



From Garbage to Profit: Creative Economy and 3R Waste Management System in Tenganan Tourism Village Bali

Ni Made Rai Sukmawati; Gede Ginaya; I Gusti Made Wendri; I Gusti Agung Mas Krisna
Komala Sari; I Dewa Gede Ari Pelayun

Tourism Departement Politeknik Negeri Bali, Indonesia

Email: Maderaisukmawati@pnb.ac.id, ginaya@pnb.ac.id, gustimadewendri@pnb.ac.id,
gungmaskrisna88@pnb.ac.id, dewagedearipemayun@pnb.ac.id

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Abstract

Trash as products of debris that resulted from activities of homemade industry or merely daily family's consumption. This study aims at investigating implementation procedure of 3-R (Reduce-Reuse-Recycle). By applying descriptive qualitative analysis, a focus group discussion was conducted equipped with observation, interview of purposive sampling procedure in order to collect a primary data. The results of the study reveal that the community group of 3-R in Tenganan tourism village as an attempt to solve the garbage problem in village areas is done through some steps. At first counselling and training was conducted in order to broaden the community insight about trash management system prior to the creative economy of utilizing garbage for profit. It is further suggested that the organic products resulted from the application of organic fertilizers of 3-R system will be certified by the related authority.

Keywords: *Garbage; 3-R, Organic; Creative Economy; Tourism Village*

Introduction

The volume of waste in Amlapura City the capital of Karangasem Regency is increasing from year to year. The biggest pile of garbage in Amlapura City comes from many kinds' sources, either organic or inorganic ones. Various household activities can generate waste, such as cooking, cleaning, washing, and others (Evans, 2018). Food scraps such as fruit and vegetable peels can become trash that piles up in the wastebasket. Not to mention the items used everyday items such as packaging for soap, toothpaste, fragrance for clothes, cotton, and cardboard. If waste is not managed properly it can cause various environmental problems such as flooding, soil, water and air pollution, as well as various diseases that can interfere with public health (Foden et al, 2019).

The amount of garbage can also reduce the aesthetic value because it disturbs the surrounding scenery and spreads an unpleasant odor. Waste problems arise due to the carrying capacity of the environment that has exceeded its threshold (Wahl & Wamsler, 2021). In addition, there is an increase in population, especially in urban areas, with behavior related to community culture and existing values

(Wolde et al, 2020). Waste handling behavior is reflected in daily habits such as not providing trash cans and throwing garbage everywhere with minimal waste handling even without any processing (Arp et al 2020). Generally, the type of waste that can be found consists of organic and inorganic waste (Yang, et al 2021). Organic waste is the largest waste volume (74.81%) is in Amlapura City. In addition, there is newsprint (8.78%), plastic (9.89%), metal, cans, iron, aluminum (2.66%), rubber, tires (2.06%), glass (0.99%), wood (0.71%), and others (0.10%).

Organic waste originating from households has the potential to be used as raw material to be processed into compost of 129,846 kg per day or about 130 tons per day (Abdel-Shafy, 2018; Margaritis, 2018). Examples of organic waste are leaves, vegetables, fruits, and food scraps, while inorganic waste is used drink bottles, both glass and plastic, cans, used newspapers, and various used plastic cosmetic containers. In terms of handling waste, inorganic waste is more difficult to handle than organic waste (Gallert & Winter, 2022). This is because inorganic waste, especially cans and plastic, is difficult to biodegrade by nature. Waste management is now a serious concern of the government in any country. In Japan, for example, waste management is carried out by setting a schedule for garbage disposal every day. For example, organic waste should only be thrown into the trash on Mondays, Tuesday to dispose of aluminum waste, and so forth (Cecilia et al, 2019; Castrica et al, 2018).

Likewise in developed countries such as the Netherlands and Sweden which apply very strict rules in disposing and managing waste. All of this is done so that little by little the waste problem can be resolved (Matsakas, et al, 2017). In Indonesia, the current waste problem has reached an alarming level (Ardi et al, 2022). City and district governments have been busy looking for final disposal sites (TPA) for municipal solid waste production (Hai, 2019). On the other hand, TPA is a problem for the surrounding community because the waste causes odors and an unhealthy environment. Households as consumers of household products or goods experience a dilemma. On the one hand, many products or household goods are needed for household activities, but on the other hand these products produce waste (Abbas et al, 2017). Like a transaction balance, processed inputs can produce a number of outputs that are useful for the body, health, environmental sanitation and so on, but at the same time also produce other outputs, namely waste. In the United States, the Environmental Protection Agency (EPA) recommended that the American public respond to this dilemma. Attention to this balance sheet is one of the values that is instilled in the community (Suhelmi et al., 2020).

Waste can be managed and processed with the principles of “Reduce”, “Reuse”, and “Recycle” which is known as 3R. The 3R principles include: (1) Reduce, namely reducing the amount of waste disposed of, (2) Reuse, namely reusing used containers or goods, and (3) Recycle, namely recycling materials that can be recycled. According to Arifin et al (2020), waste can be reduced by being frugal, reducing unnecessary packaging, and implementing practices to reduce the toxicity of waste. At the individual and household level, reducing the amount of waste can be done by: (1) frugal lifestyle in food consumption and using materials or goods, (2) being careful when buying goods, such as not too many layers of packaging, (3) buying products on a large scale.

Lots of items available for refills, and (4) paying attention to sources that produce toxic or hazardous waste. The principle of reuse can be carried out by: (1) using products or goods that can be reused, (2) maintaining and repairing durable products or goods, (3) reusing plastic bags, containers, or cans and the like, (4) borrow, rent or joint venture of goods or products that are relatively rarely used, and (5) it is better that goods or products that are still fit for use are not thrown away, but given or donated to other people who may need them. The principle of recycling can be carried out by: (1) choosing products and containers that can be recycled and recycling them, (2) choosing products made from materials that are easily recyclable, and (3) composting household waste and organic waste.

The solution in overcoming the waste problem that can be done is to handle waste up to the household level. A simple activity that can be done in reducing the volume of waste, especially from the

type of organic waste, is to manage waste into liquid organic fertilizer. The activity of processing waste into liquid organic fertilizer is very easy and inexpensive. This activity can be carried out at the household level by separating organic and inorganic waste, then the organic waste is processed into liquid organic fertilizer. According to Tursi (2019), liquid organic fertilizer is a fertilizer whose basic ingredients come from animals or plants that have undergone fermentation and the product form is in the form of a liquid. The chemical content in it is a maximum of 5%. The advantages of this liquid organic fertilizer are that it can quickly overcome nutrient deficiencies, is not problematic in nutrient leaching, and is able to provide nutrients quickly. Compared to liquid inorganic fertilizers, liquid organic fertilizers generally do not damage the soil and plants even when used frequently. In addition, this fertilizer also has a binder so that the fertilizer solution applied to the soil surface can be directly used by plants (Sim et al, 2021; Rashid et al, 2021). Compared to solid organic fertilizers (compost), liquid organic fertilizers require a faster time to manufacture.

Residential waste is waste generated from household waste in a residential environment. Almost every day in every house produces household waste. The waste can be separated into organic waste such as leftover pieces of vegetables, fruit, fruit peels, and other kitchen waste. If in a housing there are 50 - 100 houses and each household produces 5 kg of organic waste every day, the housing is able to "pile up" 250 kg to half a ton of waste every day. That number will get bigger in a matter of months or even years. If the waste accumulates and is not managed and processed properly, it will have a negative impact on the environment and the health of the residents of the housing. In addition, the potential for air pollution, environmental pollution, and the spread of other diseases is also very large. Therefore, efforts are needed to manage residential waste that is cheap, easy, and fun so that waste solutions can be handled properly. This research program aims to improve the knowledge and skills of partner groups in managing waste and making liquid organic fertilizer. The benefit obtained is to increase family income through liquid organic fertilizer entrepreneurship.

Methodology

This study is part of an activity entitled "Technology of Processing Organic Waste into Compost and Liquid Fertilizer Using Household Scale Composter in Tenganan Tourism Village". The partner of the activity is the Pokdarwis or the group of tourism awareness of Tenganan Tourism Village, which is located in Tenganan Village, Karangasem Regency, Bali Province. The number of partners who participated in this activity was 25 people.

The implementation of the activities uses the FGD and then follow-up by workshop method and participative learning with the following activities.

1. Counseling and Training

Counseling and training begins with filling out questionnaires by partner groups to determine the extent of the partner groups' knowledge regarding waste management and liquid organic fertilizer. Then the activity continued with the lecture method by providing material on: (1) waste management including household waste, the negative impact of waste, types of waste, waste management and handling mechanisms, waste management methods with 3R principles, and how to sort waste and (2) making liquid organic fertilizer (POC) includes the definition of POC, benefits of POC, advantages and disadvantages, raw materials, tools and materials used, and how to make POC. After the counseling, continued with discussion and question and answer.

2. Practice of Making Liquid Organic Fertilizer

The practice of making liquid organic fertilizer is done by first explaining the tools and materials used and then the implementation team demonstrates how to make liquid organic fertilizer. Furthermore,

the implementation team provided tools and materials to the partner groups so that the partner groups could practice them in their own homes so that the partner groups had the skills to make liquid organic fertilizer.

Results and Discussion

As Bali Aga traditional village on the island of Bali similarly to Trunyan and Sembiran, the village of Tenganan is situated in the Manggis District, Karangasem Regency. It is about 10 kilometers from the Candi Dasa tourism area which usually tourist bus come for Eastern Bali tour programs. In this case, the term of Bali Aga refers to the era before the Emperor of Maja Pahit from Java influx to the island. Therefore, residents of Tenganan village still remains their authentically traditional and customs way of life that pass from previous ones.

Most of the residents of the traditional village of Tenganan throw their garbage in *teba* territory of the village before it is transported to the end of rubbish tip in Manggis district every 2-3 weeks. This results in the accumulation of so much garbage that sometimes it reaches the road. The pile of garbage causes the road to be covered with garbage and causes a very strong stench. The stench along with the liquid waste causes flies and caterpillars (maggots) to multiply rapidly. This results in the emergence of air pollution in the form of a pungent stench and flies that can cause the spread of germs. Waste processing that has not been maximized results in more and more piles of garbage.

Activities carried out in the study of the use of appropriate technology in traditional village of Tenganan are as follows.

1. Counseling and Training

Counseling activity for the Pokdarwis partner group of tenganan village was carried out at the Banjar Hall in the traditional village. Extension activities consisted of filling out questionnaires, explaining material, discussions, and questions and answers.



Figure 1. Counseling and training on waste management for Pokdarwis Tenganan Traditional Village

Distribution of questionnaires were conducted to obtain an overview of the knowledge of partner groups regarding waste management into liquid organic fertilizer. The questionnaire consists of three parts, namely personal data, waste management, and general knowledge related to liquid organic fertilizer. The group of partners who participated in this activity were 25 people including 15 women (80%) and 10 men (20%). The last education of the partner groups varied from junior high school to

undergraduate level with the main occupation being a housewife. Based on income level, most of the partner groups are from the lower middle class with an average income of <1.5 million rupiah per month.

The understanding level of the partner groups towards waste and its management is generally still low with the volume of waste produced an average of 1 bag of garbage per day (90%) and disposing of waste every day of the week (70%) carried out in the morning (90%). 70% of the partner groups have not done waste segregation. Temporary garbage dumps at home are trash bins (70%) by placing garbage in front of the house and picking it up by garbage officers (85%).

It is part of which understands the classification of waste according to whether it is easy to decompose (55%) and that organic waste is kitchen leftovers such as vegetables (65%) although most of the respondents (80%) already know the positive impact of waste that can be processed into compost or goods other benefits (80%) besides the negative impact of waste that can cause disease and disturbing aesthetics.

Table 2. The general knowledge of waste types and impacts

Types of waste		Impacts	
Decomposes	Mixture	Positive	Negative
Organic and inorganic	Kitchen leftovers	Can be processed into compost or other useful goods	Cause disease and interfere with aesthetics
Wet and dry	Plastic or glass	Provide positive benefits	Reflect the low social status of the community

Source: Data processed 2022

Lack of residents' knowledge about sorting and grouping waste into organic and inorganic waste has an impact on the level of understanding of residents regarding the use of organic waste as material for making liquid organic fertilizer. For knowledge about liquid organic fertilizer (Table 3), the partner group generally did not know how to make liquid fertilizer at household scale (90%). Even so, there were around 45% of the respondents who already knew the basic ingredients for making organic liquid fertilizer, namely those that come from living things that have died.

Material that was conveyed in the extension activities were waste management and liquid organic fertilizer manufacture. Based on the results of discussions and questions and answers, so far the partner groups have not separated waste. However, after being given an explanation on how to manage waste with the 3R principle and how to sort waste, the partner groups have separated waste in their respective homes. Garbage that is disposed of and picked up by garbage workers is only waste that cannot be made into fertilizer. The partner group also already knows about the benefits of liquid organic fertilizer and is interested in making liquid organic fertilizer. Apart from the fact that the material is easy to obtain, namely from household waste which is considered useless and will be thrown away,

Table 3. Liquid organic fertilizer

The fertilizer source	Utilized materials
Non-chemical compound fertilizers	Non-plastic waste
Factory processed fertilizers	Drinks cardboard
Fertilizers derived from mineral materials	The rest of the fruit skin
Fertilizer comes from living things that have died	Non soap water

Source: Data processed 2022

With this activity, the partner group who has a hobby of farming in the yard, becomes even more enthusiastic about caring for their plants. Liquid organic fertilizer is indeed useful in fertilizing plants and is known to be more environmentally friendly and does not give residue like the use of chemical fertilizers. According to Suryati (2014), liquid organic fertilizers provide many improvements to soil function, both physically, chemically, and biologically.

Activities of counseling and training run smoothly in a family atmosphere. During the activity, there was a good dialogic atmosphere with lots of questions and responses to the material provided (Figure 3). The questions raised included the types of organic waste that could be used, materials that could be used to make liquid organic fertilizer, and the process of counting the materials. Basically all organic waste can be used as raw material for making liquid organic fertilizer, such as food scraps, vegetable stems, rotting fruits, eggshells, leaves of yard waste, and so on. However, it is necessary to avoid large bones and food scraps that contain oil. According to Suryati (2014), oil is difficult to decompose and creates residues (residual materials) that will continue to exist even though they have been processed. The oil is feared to interfere with plant metabolism. All raw materials to be used should be chopped or chopped first so that the decomposition process takes place quickly. According to Kris (2013), the small size of the material, the long fermentation time, and the large amount of EM4 can speed up the degradation process and affect the quality of the liquid fertilizer produced.

2. Liquid Fertilizer Making Practice

The practice of making liquid organic fertilizer is carried out so that partner groups have knowledge and skills in making liquid organic fertilizer. The activity began with an explanation of the tools and materials used and continued with demonstrations and practice on how to make liquid organic fertilizer. The tools used in making liquid fertilizer are 20 liter plastic barrels or buckets that have a lid, a knife for cutting, sacks of rice, and raffia rope. The materials used are organic waste from household waste, old coconut water, first rice washing water, clean water, brown sugar (substitute for molasses), EM4 (Effective Microorganism) activator, shrimp paste, and dab soap (to repel flies). In the practice of making liquid fertilizer using EM4 activator. However,

EM4 is one of the activators that is easy to find in farm shops. The use of EM4 in accelerating the production of liquid fertilizer is considered a technology because it aims to speed up the fermentation process. EM4 is a mixed culture of various types of beneficial microorganisms, namely photosynthetic bacteria (*Rhodospseudomonas* sp.), lactic acid bacteria, yeast (*Sacharomices* sp.), Actinomycetes, and fermenting fungi (*Aspergillus* sp.) (Amertaningtyas, 2022; Astutik et al, 2020; Djalil et al, 2020). To reduce the cost of purchasing EM4, partner groups use MOL which is made according to materials available in the surrounding environment and easy to obtain, such as rotten fruits. Examples of variations in materials used in fruit MOL include rotten bananas, rotten papaya, rotten melon, starch water, granulated sugar, and papaya rind as a source of microorganisms (Nurhayati et al, 2022; Nurtjahyani et al, 2022).



Figure 2. Materials for making liquid organic fertilizer

For making liquid fertilizer, first all the solid waste is chopped and then put into sacks of rice and tied using a raffia rope. The barrel or bucket is filled with 3/4 of the water then added to the rice washing water, coconut water, crushed brown sugar, and EM4 then stirred until smooth. The sack that has been filled with waste is put into a barrel or bucket and attempted to sink (can be pressed with a stone). The edge of the barrel or bucket is then smeared with dab of soap. The barrel or bucket is then closed tightly and every 3 days it is stirred or immersed for about 10 minutes.

Seth 2-3 weeks, the fermentation process will be complete and the liquid fertilizer is ready to be packed. The successful fermentation process is indicated by the presence of white spots on the surface of the liquid. The liquid produced from this process will be yellow-brown in color with a distinctive pungent smell or aroma (Karneta et al, 2022; Sugiharti et al, 2022).

The practice of making liquid organic fertilizer was continued by providing opportunities for partner groups to practice on their own in their respective homes with the tools and materials provided. Based on the evaluation carried out after 2 weeks, the partner group did not experience significant difficulties, even though the partner group had never made organic liquid fertilizer themselves. The partner group is very interested in continuing to make liquid organic fertilizer, because in addition to reducing waste it can also increase income if this liquid organic fertilizer can be produced professionally on a home industry scale.

The problem faced by partner groups in making liquid organic fertilizer is the emergence of a very pungent odor from the liquid organic fertilizer that is made. Therefore, the implementation team provided suggestions for eliminating the distinctive smell of liquid organic fertilizer by using aromas produced by natural ingredients, such as pineapple, citronella, citron and *pandan*. Household waste can be added pineapple as deodorizer. According to Basri et al (2021), for every 330 ml of liquid fertilizer, medium-sized citron juice is used. When using *pandan* leaves, use squeezed water from 6 pieces of *pandan* leaves mixed with enough water. Meanwhile, when using citronella, use squeezed water from 6 stalks of fragrant citronella which is pounded and mixed with enough water.

Conclusion

Research activities of utilizing garbage into advantage products carried out in Tenganan tourism village, several things that can be concluded are (1) the partner group has knowledge of waste management, but has never practiced making household-scale liquid organic fertilizer with the basic ingredients of organic waste, (2) the partner group already has the knowledge and skills in making liquid organic fertilizer, (3) partner groups have actively participated in the activities carried out, and (4) mentoring activities need to be carried out so that these activities can continue.

The suggestion can be given for the sake of further utilization of the liquid fertilizer is that the Tenganan community should be encourage to use the fertilizer whenever every farmer is planting rice, vegetables, fruits, and any other horticultural crop as a starting point of giving evidence that the home industry fertilizer product is beneficial before it can be sold outside.

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