

## Youth Involvement in Processing Kitchen Waste into Eco-Enzyme as Air Freshener in Sanur Kauh Village -Denpasar City

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### ABSTRACT

The community service carried out in Sanur Kauh Village, Denpasar-Bali aims to increase the knowledge and skills of village youth in managing household waste and utilizing it in eco-enzymes. Youth involvement in waste sorting at the household level is still low, the evidence being that only 7% of youth are regularly involved in waste sorting. The youth argued that waste management in the household was already carried out by parents. 2 young people had attended eco-making training but had never put it into practice because they had only attended the training once. Eco-enzyme production from fruit and vegetable waste, apart from being able to reduce the volume of waste, also produces products of economic value. One of the eco-enzymes can be used as an air freshener.

## **INTRODUCTION**

Sanur Kauh Village is one of the villages located in South Denpasar district, Bali Province. Sanur Village is located in a lowland with an altitude of 0-10 M above sea level which belongs to the South Bali Region. The total area of Sanur Kauh Village is 386.0 ha, most of which are residential areas and a few moor and rice fields. The population of Sanur Kauh Village in 2020 was 8,895 people and in 2021 it was 9,099 people with details of 4,428 men and 4,671 women with an average population density of 2,352.85 km<sup>-2</sup> people. Sanur Kauh Village as an urban area also faces waste management problems. To cope with the increase in waste volume, a temporary shelter has been built, the Palasari Depot which has been operating since 2021. The temporary shelter uses land borrowed from the community that can one day be asked back, to serve waste from 9,099 people. Tackling the waste problem, the Bali Provincial Government issued Bali Governor Regulation Number 47 of 2019 concerning Source-Based Waste Management. Source-based waste management provides opportunities for the community to be creative in processing the waste produced, such as into compost, liquid organic fertilizer, eco-enzyme, brequettes or into biopesticides. This policy is expected to encourage the community to reduce waste disposal and process waste at its source. One source of waste is the household kitchen and the involvement of family members in managing it becomes important.

Community participation cannot be separated from youth participation to realize sustainable household waste management (Naldi, 2023). Youth have a position as agents of change in the management environment. Their concrete actions can affect not only themselves, and the people within their community, but also the environment itself (Harisoesyanti, 2019). Youth, especially millennials, can be partners with the government in overcoming social problems (Kania et al., 2020). To increase youth participation, there needs to be intensive interventions involving stakeholders, especially local governments. Monthly or bi-monthly socialization and rewards are needed to optimize youth participation in household waste management (Naldi, 2023). Young people, on the other hand, are considered the most vulnerable consumer group to food waste (Marek-Andrzejewska & Wielicka-Regulska, 2021). Household waste management can be used as a product that has economic value. One alternative to waste management is to overcome this problem carefully and sustainably by recycling waste into eco enzymes derived from organic waste, namely vegetable and fruit residues (Margery & Suryani, 2023). This strategy can be a step in reducing the amount of waste and producing environmentally friendly multipurpose products that function as floor cleaners, equipment washers, gardening, and air fresheners (Vama & Cherekar, 2020). Turning waste into eco-enzymes is the first step to achieving waste freedom in households. Zero waste means being responsible for waste generation to reduce waste, reuse, and recycle (Murray, 2020). On the other hand, the concept of zero waste is also an effort to organize waste to be left (Komari et al., 2011).

Eco-enzyme is a solution of complex organic compounds created from the fermentation of kitchen waste in the form of fruit skins and vegetable waste. The use of the term eco-enzyme was initiated by Dr. Rosukon Poompanvong, founder of the Organic Agriculture Association, Thailand, who has been conducting research since the 1980s (Muliarta & Darmawan, 2021). A naturopath from Penang, Malaysia, Dr. Joean Oon then spread the use of the term more widely (Novianti & Nengah Muliarta, 2021). Eco-enzyme in the form of a dark brown liquid is made from waste, water, and sugar in a ratio of 3: 10: 1 (Vama & Cherekar, 2020). Fermentation to produce this environmentally friendly enzyme liquid takes 3 months. There is a gas produced during the fermentation process in the form of ozone gas (O<sub>3</sub>) (Davenport et al., 2019). Other forms of products are NO<sub>3</sub> (Nitrate) and CO<sub>3</sub> (Carbon trioxide) needed by the soil as nutrients (Rochyani et al., 2020). Partners in this case youth in Sanur Kauh Village have a desire to improve their knowledge and skills on how to make eco-enzymes. This interest is also related to the efforts of partners who want to reduce the amount of waste at the household level so that waste can be minimized. Efforts to produce eco-enzymes are also an alternative to reduce the use of commercial air fresheners or air fresheners. This step is a joint effort to reduce pollution to land, water, and air and improve public health.

## **IMPLEMENTATION AND METHODS**

Community service carried out in Sanur Kauh Village, Denpasar-Bali aims to increase the knowledge and expertise of partners, especially village youth, about household waste management and making eco-enzymes. Participants who participate have the desire to improve their knowledge and skills in processing household waste, especially vegetable and fruit waste into products of economic value. Processing vegetable and fruit waste is one alternative way to reduce the accumulation of waste at home. The strategy of utilizing vegetable and fruit waste at the household level is an effort to implement the concept of zero waste from the household level. Methods used in carrying out community service activities include observation, interviews, socialization, and plot demonstrations. Activities began in early July 2023 in the form of field observations until the end of August 2023 with plot demonstration activities. Socialization activities and demonstration plots were carried out at the Sanur Kauh Village Office, Denpasar City by involving village youth.

### **Observation**

The observation method was used to determine the involvement of village youth in waste management at the household level. Observation or observation can be used to study the habits of youth in treating the waste produced and their interest in managing household waste. One of the literature states that this method allows researchers to collect data and understand social processes using the five senses and reflexes as the basis (Ekka, 2021). Researchers can understand people's actions, responsibilities, and behaviors through observation (Walshe et al., 2012). Observational data can be included in addition to or as a result of confirmation. The observation step is another way to corroborate research findings (Jamshed, 2014). Observation contributes to theoretical and conceptual

development and explains social processes in palliative care. In particular, it helps to understand structure (Walshe et al., 2012).

### **Interview**

Interviews were conducted to obtain more detailed information about youth habits in managing household waste. There were 10 questions asked, including those related to household waste management habits, utilization efforts, and challenges when utilizing. Interviews were conducted with 15 young people who were participants in socialization and demonstration plots. One view reveals that 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).

### **Socialization**

The socialization method is carried out as a means for the transfer of knowledge related to waste management theory, households starting from sorting and processing household waste into eco-enzymes. The socialization will be held at the Sanur Kauh Village Office on Saturday, August 19, 2023. Socialization activities are expected to help partners understand that the waste produced is waste from 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) believes that socialization is often synonymous with delivering information, although it can be interpreted as a transfer of knowledge.

### **Plot Demonstration**

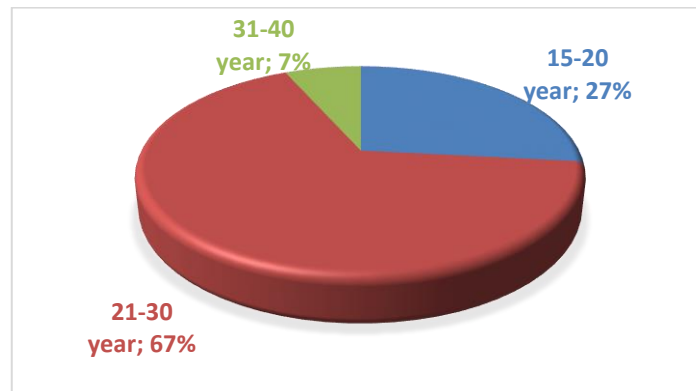
The plot demonstration method is aimed at deepening the knowledge and skills of partners after socialization. This effort is a form of deepening theory because participants will learn about the stages of the process or action in utilizing vegetable and fruit waste as the rest of activities in the kitchen into eco-enzymes. The demonstration plot was carried out to accelerate the adoption of technology to utilize vegetable and fruit waste into eco-enzymes. Sseguya et al. (2021), are of the view that plot demonstrations are an effective form for better skill improvement in technology adoption. The demonstrations are also designed to motivate partners in this case the village youth do so in daily practice.

### **Monitoring and evaluation**

Monitoring and evaluation are carried out to ensure activities are run by the plans and stages that have been set. 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 basis for the achievement of activities carried out

## RESULTS AND DISCUSSION

Youth in Sanur Kauh Village 67% of them are aged 21-30 years and 27% are in the age range of 15-20 years (Figure 1). The UN report states that 1.2 billion or 16 percent of the global population are adolescents aged 15 to 24 years. In addition, the youth population is also projected to increase growth by 7 percent (Perwithosuci et al., 2023). Youth in Indonesia based on Law No.40 of 2009 are defined as Indonesian citizens aged 16 to 30 years which is an important period of age of growth and development. The results of the 2022 Susenas estimate the number of youth at 65.82 million people or almost a quarter of the total population of Indonesia (BPS, 2022). Some define youth as citizens aged 18-30 years. There are more than 63 million young people representing 26 percent of the total population of 238 million people (Goodwin & Martam, 2021). Those whose ages ranged from 16-24 years described the category of transitional age youth (Kaligis et al., 2021).



**Figure 1. Distribution of the average age of youth in Sanur Kauh Village, Denpasar**

Based on the Education category, the average youth in Sanur Kauh are still high school students and the highest average education is the high school level. The 2022 Indonesian Youth Statistics Report states that the level of youth education can be seen from the highest level of education they have completed. The majority of youth have completed their education up to high school/equivalent (39.60%) and junior high school/equivalent (35.78%). About 10.97 percent of youth have completed education up to PT and around 10.83 percent of youth only graduated from elementary school/equivalent, the rest did not finish elementary school or have never been to school. Higher education is more achieved by youth who live in high household expenditure distribution groups (BPS, 2022).

### **Household Waste Production in Sanur Kauh Village**

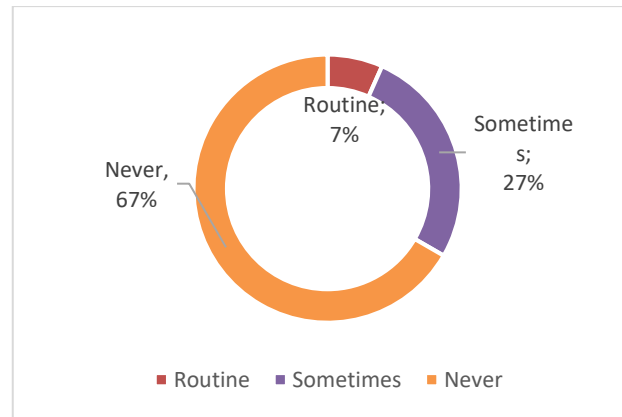
The youth of Sanur Kauh Village predicts that the average waste produced by each household is around 1-5 kg day<sup>-1</sup>. The rest of the vegetables and fruit skins become one of the organic waste produced from the kitchen. This amount is the same as the results of a study in Kurdistan City, Iraq, where the amount of waste produced by households averages 2 kg day<sup>-1</sup> (Hama et al., 2021). The volume of waste produced by one family is strongly influenced by concern for the environment, income level, and number of family members (Herianto et al., 2019).

The World Bank estimates that by 2050 3.4 tons of solid waste will be generated worldwide. Countries in Southeast Asia are estimated to contribute 1.14 kg of capita-1 day-1 waste. All countries in Southeast Asia produce solid waste dominated by organic waste as much as 50-70% of the total waste (Arumdani et al., 2021). The rest of fruits and vegetables are organic waste rich in phytochemicals, and compounds with nutraceutical properties (Mani et al., 2018). Household waste in the form of fresh fruits and vegetables contributes almost 50% of wasted food. Studies conducted in European Union countries show fresh fruits and vegetables contribute almost 50% of food waste generated by households (De Laurentiis et al., 2018). Waste materials in the form of leather produced from the fruit and vegetable industry have caused nutritional, and economic losses and caused environmental problems. It is estimated that the processing of fruits and vegetables produces waste reaching 25-30% of the total product (Kumar et al., 2020).

Waste materials in the form of leftover fruits and vegetables can be used for making eco-enzymes. Making environmentally friendly enzymes is part of the steps to recycle waste from the source. This strategy can help reduce the volume of waste and have a positive economic impact (Vama & Cherekar, 2020). The utilization of remaining fruits and vegetables into eco-enzyme is also an effort to realize a clean environment and a commitment to implementing zero waste. (Hemalatha & Visantini, 2020).

### **Youth Involvement in Household Waste Sorting**

It is recorded that only 7% of youth in Sanur Kauh Village are routinely involved in sorting household waste. As many as 67% of youth admitted that they had never been involved in sorting household waste (Figure 2). The reluctance of youth involvement in household waste sorting tends to be due to reasons already done by parents and limited understanding of household waste management. This reason is in line with previous research which stated that the younger generation does not have enough knowledge about waste sorting in their area. However, the younger generation still tries to protect the environment and have a positive attitude towards the issue of waste sorting (Stepień et al., 2013).



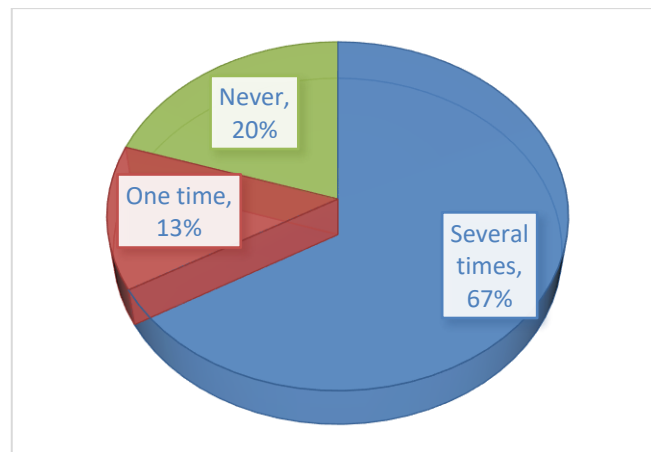
**Figure 2. Overview of youth involvement in waste sorting in Sanur Kauh Village**

The top three reasons were mixed collection and transport (26%), lack of sorting facilities (23%), and lack of time (22%). These findings provide useful insights for local governments in developing mechanisms for implementing waste sorting at source on a larger scale as part of waste reduction programs (Setiawan, 2020). Young people are the segment of society that is most likely to waste food, increasing the amount of household waste and needs to be monitored. Marketing and sales strategies negatively affect individual behavior in generating waste (Mondéjar-Jiménez et al., 2016). One of the habits in sorting waste is influenced by lifestyle, for example, lazy to change and do not have time (Choon et al., 2017). Intervention steps are important to change habits and decisions in implementing waste sorting (Árnadóttir et al., 2019). Success indicators in waste sorting programs are related to awareness of the benefits of waste sorting, especially related to the need for a clean environment. Waste sorting activities will be increasingly in demand if there are financial rewards from stakeholders (Mugambe et al., 2022).

Segregation is the first step in waste management and recycling because there is an opportunity to reduce wasted resources (Sabiini & Rishmany, 2019). Lifestyle is another influential factor in waste management, in addition to the provision of trash cans according to the type of waste (Choon et al., 2017). There are inhibiting factors that reduce community participation in waste management, including lack of facilities, lack of training, and limited socialization (Limon & Villarino, 2020). Routine socialization activities and sustainable waste management are a necessity and are followed by providing incentives and disincentives (Wulandari et al., 2021).

### **Utilization of Vegetable and Fruit Waste**

Regarding the use of household waste, it was recorded that 67% of young people in Sanur Village had used waste as products of economic value several times, one of which was compost (Figure 3). The utilization of household waste carried out is related to school or campus assignments. The utilization of waste carried out has not been at the stage of utilizing with the aim of reducing the volume of waste produced. However, the youths in Sanur Kauh Village admitted that they had never used kitchen waste, especially vegetable and fruit residues, to become eco-enzymes.



**Figure 3. The frequency of utilization of household waste by youth in Sanur Kauh Village**

The results of research in Sinjai Region, South Sulawesi, Indonesia show that the attitude of youth in waste management is ranked at the bottom, especially in waste management and utilization of waste produced. This is shown by 63% of adolescents who do not sort waste and 64% of adolescents who do not use waste (Waris et al., 2020). Motivation in principle has the most important influence on intention, followed by moral obligations, perceived behavioral control, subjective norms, situational factors, and attitudes (Heidari et al., 2018). Waste management such as utilization, recycling, and reuse are simple techniques that can be applied to reduce the amount of landfilled waste (Sarbasov et al., 2019). One way to recycle household waste is to turn it into eco-enzymes. This approach is beneficial in reducing the volume of waste and produces an environmentally friendly versatile liquid that can be used as floor cleaner, clothes cleaner, gardening and air freshener (Vama & Cherekar, 2020).

The strategy of utilizing the remaining fruits and vegetables into environmentally friendly enzymes is a form of implementation of the zero waste concept at the household level. Zero waste means a form of responsible waste generation to reduce, reuse, and recycle the waste produced (Murray, 2020). Zero waste is also a form of waste management that does not produce residues so that the use of natural resources can be optimized (Komari et al., 2011).

### **Eco-Enzyme Making Training**

It was recorded that out of 15 socialization and training participants, only 2 young people had attended training on making eco-enzymes. The participants also only attended the training once, so they did not understand the basic concept of making eco-enzymes. This condition is in line with one of the results of community service in Giri Mekar Village, Ujung Berung, Bandung which found that there are still people who have not recycled organic waste into eco-enzymes, although eco-enzyme socialization continues to be carried out by volunteers through several methods (Surtikanti et al., 2021). Generally, no one has tried to make ecoenzymes at home for busy reasons and is lazy to make eco-enzymes (Maulana & Khumaeroh, 2021). Another challenge is that eco-enzyme production

takes 3 months, so innovation is needed to be able to produce it quickly (Rahayu et al., 2021).



**Figure 4. Socialization of making eco-enzyme**

The awareness and concern of the village community towards waste handling is generally still lacking. This is characterized by the habit of burning waste that is still inherent in the community in managing waste (Zulfahmi Yasir Yunan et al., 2022). Socialization to the community about the importance of this will minimize the negative impact of waste by implementing sustainable waste management (Yenita & Widodo, 2020). The application of the training has proven effective in improving household waste management behavior. Socialization and training on waste management effectively improve community knowledge, attitudes, and behavior in managing household waste to reduce the number of disposal waste (Hubaybah Hubaybah et al., 2022).



**Figure 5. Demonstration of eco-enzyme manufacturing plot**

The continuous training process will make people understand well and systematically how to make eco-enzymes, as well as indicators of success in making eco-enzymes, namely brownish color, characteristic smell of fermentation, and  $\text{pH} \leq 4$  (Rusdi & Alam, 2022). The utilization of organic waste to produce environmentally friendly enzymes gives hope and benefits about good utilization and sustainable organic waste (Sudaryantiningih & Pambudi, 2023). So far, the large amount of leather waste generated from fruit and vegetable-based industries and household kitchens has caused huge nutritional

and economic losses as well as environmental problems. Fruit and vegetable processing alone produces significant waste, reaching 25–30% of the total product (Kumar et al., 2020).

### **Eco-Enzyme as Air Freshener**

Everyone can make eco-enzymes because of the easy manufacturing process. The presence of organic acids such as acetic acid and lactic acid as well as metabolic compounds such as flavonoids, alkaloids, and saponins makes eco-enzymes able to act as antibacterial (Nurlatifah et al., 2022). Eco-enzyme also has the potential to be an organic fertilizer solution for agriculture so that it can reduce the use of chemical fertilizers, better vegetable and fruit yields, and an unpolluted environment. Eco-enzymes can help maintain sanitation and control lake water quality. Economically, Eco-enzyme has the potential to save expenses and obtain additional community income (Farma, 2022).

Products that can be produced by managing organic waste into eco-enzymes include liquid soap, toilet cleaners, air fresheners, and water purifiers (Abidin et al., 2022). Eco-enzyme has a strong sweet-sour fermented aroma due to orange, pineapple, and papaya peels. Eco-enzyme solution when mixed with water, will react and can be used as a disinfectant liquid (Rusdianasari et al., 2021). One of the uses of eco-enzyme is as a room freshener or deodorizer (Mursalin et al., 2023; Sirait et al., 2023). The difference in Eco-Enzyme concentration results in a significant difference in odor intensity. Eco-enzyme spray can eliminate the smell of cigarette smoke using a concentration of 1:3 (Sirait et al., 2023).

The enzyme content in eco-enzymes includes protease, lipase, and amylase which functions to degrade or decompose proteins, carbohydrates, and fats. Fermented liquid, eco-enzyme has used to kill pathogens. (Arun & Sivashanmugam, 2015). The content of acetic acid in coenzyme can destroy organisms, so it can be used as an environmentally friendly insecticide or pesticide (Rasit et al., 2019). The production of eco-enzymes not only reduces the collection of organic waste but also provides a substitute for synthetic chemicals that are harmful to human health and the environment (Benny et al., 2023). The selection of the type of organic matter can be adjusted to the needs and use. Eco enzyme products for air fresheners can be made using fresh-smelling ingredients such as oranges, mangoes, pineapples, and others (Setiawati, 2023).

### **Monitoring and evaluation**

Monitoring and evaluation activities are carried out from beginning to end to determine the contribution and changes of partners. The purpose of monitoring and evaluation is to document changes in the knowledge and behavior of village communities involved in the process of converting fruit and vegetable waste into ecological enzymes. The monitoring and evaluation process also aims to ensure the participation of the people of Sanur Kauh Village in household waste management, so that the concept of zero waste can be applied at the household level (Table 1).

**Table 1. Partner Response**

<b>Response</b>	<b>Before counseling and demonstration of plots</b>	<b>After counseling and demonstration of the plot</b>
Waste sorting	Awareness to be involved in sorting household waste is low, because it has been done by parents	There is a desire to be involved in sorting and managing household waste, because it knows the benefits of sorting and processing waste
Motivation to process waste into eco-enzyme	Do not know how to make and the benefits of eco-enzyme.	Motivated to process waste into eco-enzyme because they know how to manufacture, benefits and economic value of eco-enzyme
Perception of eco-enzymes	Making eco-enzymes is complicated and takes a long time	Eco-enzyme has a variety of benefits and is an alternative in the use of household waste.

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## CONCLUSIONS AND RECOMMENDATIONS

Household waste production in Sanur Kauh Village ranges from 1-5 kg day<sup>-1</sup>. Youth involvement in waste sorting at the household level is still very low, as only 7% of youth are routinely involved in waste sorting. The reluctance of youth involvement in sorting household waste tends to be due to reasons already done by parents. Regarding the use of waste, it was recorded that 67% of young people in Sanur Village had used waste as compost several times. The utilization of household waste carried out is related to school or campus assignments. 2 young people have attended training in making eco-enzymes. Unfortunately, it has never been practiced because it has only been trained once, so it does not understand the basic concept of making eco-enzymes. Making eco-enzymes from kitchen waste materials, especially fruit and vegetable waste, in addition to being able to reduce the volume of waste also produces products that have economic value. The eco-enzyme produced by one of them can be used as a room freshener. Eco enzyme for air fresheners can be made using fresh-smelling ingredients such as orange, mango, pineapple, and others.

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