

Community Empowerment through Organic Waste Processing

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Abstract: Bukittinggi is the largest wholesale trade center on the island of Sumatra. In the economic sector, Bukittinggi is the city with the second-largest GRDP in West Sumatra. The most visited tourist spot is Jam Gadang. Throughout 2020, the volume of waste in Bukittinggi City transported to the landfill in Payakumbuh was 40,424 tons, or 110.25 tons/day. This number increased compared to the volume in 2019 of 32,236 tons or 107.4 tons/day. Based on these problems, community solutions are needed. The solution offered is separating and processing organic waste into eco enzymes as a solution to reduce the accumulation of organic waste. Eco enzyme is a liquid extract produced from fermenting leftover vegetables and fruit with brown sugar as a substrate. The activity plan is carried out with the main aim of overcoming problems that occur in partner communities as previously described. This Community Partnership Program uses counseling and training methods for making Eco Enzyme from organic waste so that community groups in Pulau Anak Air Bukittinggi Village can manage organic waste into fertilizer, cleaners, etc. The activity stages begin with the preparation stage, the implementation stage, and end with the monitoring and evaluation stage. The output targets to be achieved include articles, activity videos, liquid fertilizer, cleaners, etc. which can be used by the community, especially the PKK and Pokdarwis groups in Pulau Anak Air Bukittinggi Village.

Keywords: Eco enzyme; Liquid fertilizer; Organic trash

Introduction

One of the development goals of a region is to improve the region's economy (Deng et al., 2023). Economic improvement is not only oriented toward the development and growth of Gross Regional Domestic Income (GRDP) but also takes into account the rate of growth and population increase (Surya et al., 2021). Saying that economic growth is the process of increasing per capita output in the long term, where the percentage of increase in output must be greater, higher than the percentage increase in population, and there is a tendency that this growth will continue in the long term. The tourism sector is designated as the superior potential of the Bukittinggi City area based on the natural and geographical conditions of the Bukittinggi City itself (Afnarius et al., 2020). The city of Bukittinggi

currently has an area of + 25.24 km² located in the middle of West Sumatra Province with an altitude of between 909–941 M above sea level. The air temperature ranges from 17.1°C to 24.9°C, which is a cool climate. Its strategic position is a triangle of roads leading to the north, east, and south of Sumatra (Sudarmadji et al., 2018).

The hilly and valley topography of the city with beautiful natural panoramas and surrounded by three mountains, Merapi, Singgalang, and Sago, seems to be a supporting pillar to strengthen Bukittinggi. This is what causes Bukittinggi to be called Tri Arga City. Apart from that, Bukittinggi is also equipped with historical relics that can be categorized as wonders, such as the Japanese Hole, Fort De Kock Fort, Gadang Clock, etc. This proves that Bukittinggi is an old city full of history, one of which is always attached to the nation's history, namely

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(Humaidi, 2022): Bukittinggi became the capital of the Republic during the PDRI period December 1949 – July 1950. This natural gift, supported by historical gifts, makes Bukittinggi an attractive tourist destination to enjoy. Synergy with other regional superior potential (Fuhrmann & Madlener, 2020). Bukittinggi is also being developed into trade and service tourism, health tourism, conference and rest tourism as well as other services. This can be proven by the contribution of the tourism sector to supporting Bukittinggi's PAD, namely: between 30-40%.

Judging from its role in GRDP in 2012, the contribution of the tourism sector (wholesale & retail trade, hotels, restaurants, transportation, and entertainment & recreation) was 36.93%. This figure shows a high and dominating contribution to GRDP. However, if we look at it sectorally, apart from the wholesale & retail trade sector and the transportation sector, the contribution of other sectors such as hotels, restaurants, and entertainment & recreation is relatively small, namely below 3%. However, the percentage contribution of a sector to GRDP is not the only reference for whether or not the sector can be developed as a superior and strategic sector. An in-depth study needs to be carried out to obtain data and information that is useful for determining future development planning (Rashid et al., 2019) and whether this sector can provide a multiplier effect on output, household income, and labor, and can be a sector that attracts and encourages other sectors to grow. and develop (Rasool et al., 2021). So far it is not known how much influence the tourism sector has on the economy of Bukittinggi City comprehensively (Atmojo & Fridayani, 2021). Currently, Bukittinggi has fairly good access to this city.

their villages into tourist attractions or tourist villages. The potential they excel in is natural beauty, where village objects or tourism that have natural beauty have become tourist destinations that are currently popular with tourists. The emergence of a new tourist village invites great attraction for tourists to come to see it.

Apart from the tourism sector, the city of Bukittinggi is also famous for the trade and services sector which has been designated as a superior regional potential which is in line with the function of Bukittinggi itself. The history of Bukittinggi City started with the establishment of Pasar Atas on Kandang Kabau Hill in 1858 which was intended as a place of transactions for the people. This location developed and expanded to become the center of Bukittinggi community activities. Thus, from the beginning, Bukittinggi was intended and had a function as a trading place. Along with the rapid development of trade activities, it is also attached to the function of providing services (Bukittinggi City Government). Can be seen on the map below.

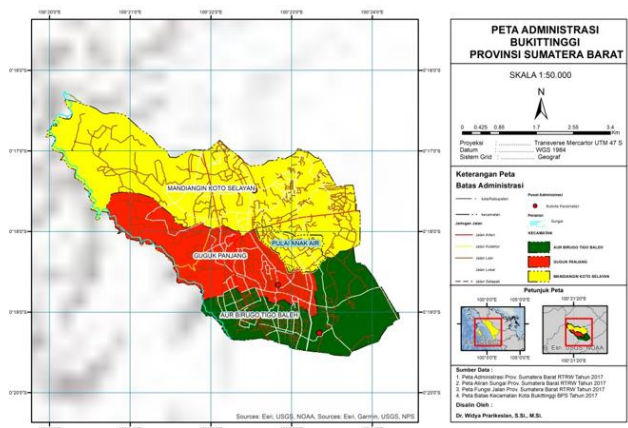


Figure 1. Map of Bukittinggi City

Table 1. Foreign and Domestic Tourists Visiting Bukittinggi

Year	Foreign Tourists	Domestic Tourists
2015	25970	434935
2014	31765	400538
2013	32068	404145
2012	26802	360191
2011	26629	332246

This shows that there are deficiencies in Bukittinggi tourism so there is a decrease in tourists visiting. This comes from there are differences in stakeholder perceptions and also a lack of empowerment community, unprofessional and poorly planned management of tourist attractions, waste, and so on. Nowadays there has been an interesting development in tourist villages. This is a new trend that is currently developing in society and continues to increase from year to year. Villages that have potential in Indonesia are increasingly actively developing themselves to develop

The problem of waste management is the biggest challenge for small and large city authorities in developing countries. This is mainly due to the increase in waste generation and the burden on the city budget. Apart from its high costs, solid waste management is also associated with a lack of understanding of the various factors that influence the entire handling system. Analysis of literature and reports related to waste management in developing countries shows that there is little quantitative information (Abdel-Shafya et al., 2018). Waste is a problem that we must solve as early as possible. Waste is a product that cannot be avoided by society. Solid waste consists of all waste that originates from human and animal activities and is discarded as useless or unwanted (Abdel-Shafya et al., 2018). Increasing household waste production is one of the impacts of population growth and increasing standards of living in urbanization.

Around 70% of municipal waste in Indonesia comes from residential areas. The volume of waste going to landfills will be greatly reduced if households use organic waste to make fertilizer because 70% of household waste is organic and 30% is non-organic (Lina, 2018). If the 3R Program is successful it will create better environmental sanitation (Balitbang., 2009).

Waste and its management is now an increasingly urgent problem in cities and villages in Indonesia because if it is not handled properly it will result in adverse or unexpected changes in the environmental balance that can pollute the environment, both land, water, and air. Therefore, to overcome this pollution problem, it is necessary to handle and control waste. Handling and control will become increasingly complex and complicated with the increasingly complex types and composition of waste in line with the advancement of culture (Damanhuri et al., 2016). The absence of planning documents for the implementation of waste management in Padang Pariaman Regency also means that waste conditions are not well coordinated. This activity does not focus on the economic aspect but rather reveals in detail the problems in the main aspects that are prioritized for resolution, namely the absence of TPS (Temporary Shelters) in Ulakan, Ulakan Tapakis District, and the lack of organic waste management that meets environmental health requirements.

Cutting the flow of waste distribution to landfills and waste management is an effective solution and speeds up the processing of waste into more useful products. This effective method can be realized through making eco-enzymes which can be applied at the household level. Eco-enzyme is a liquid extract produced from fermenting vegetable and fruit residues with brown sugar as a substrate. The principle of the process of making eco-enzyme itself is similar to the process of making compost, but water is added as a growth medium so that the final product obtained is in the form of a liquid which is preferable because it is easier to use. The specialty of this eco-enzyme is that it does not require a large area of land for the fermentation process such as the compost-making process, and this product does not even require a certain specification composter tank. Used bottles of mineral water or other products that are no longer used can be reused as eco-enzyme fermentation tanks.

This supports the concept of reuse in saving the environment. Eco-enzyme only requires media the size of a bottle so it can save processing space and can be applied at home. Apart from that, eco-enzymes have many benefits, such as being used as a plant growth factor, a mixture of floor cleaning detergent, cleaning pesticide residues, descaling, and reducing the temperature of car radiators. Good and planned waste

management in the city of Bukittinggi can make a positive contribution to society. So that the funds that were originally allocated for waste disposal costs from the city of Bukittinggi to Limbukan Payakumbuh can be allocated to other areas that can be more useful. If waste management can be implemented by involving community participation with the 3R concept, it is hoped that it will bring economic value to the community. Apart from hurting human health, poor waste handling also hurts the environment. Often, rubbish that accumulates in water channels causes the water flow to become unstable and has the potential to result in flooding. Apart from that, liquid waste around water channels will cause an unpleasant odor. The aim of waste management at the Rukun Warga (RW) level is to convert waste produced by households into goods of economic value or convert it into materials that do not harm the environment. By managing household waste correctly, Bukittinggi is expected to be able to reduce the number of waste accumulations.

Based on the background above, this research aims to overcome the problems that occur in partner communities as previously described.

Method

This Community Service Activity will be carried out in Pulau Anak Air Village. Participants involved in this service activity are people who are members of the PKK and Pokdarwis groups.

Preparation of Extension and Training Work Programs

Preparation of outreach programs and training work programs so that the activities carried out are more organized and focused. This program covers all matters of a technical, managerial, and scheduling nature.

Preparation of Training Modules

The training module includes organic waste collection techniques, materials, tools used, steps for making eco enzymes and monitoring the fermentation of organic waste into eco enzymes.

Preparation of Training Facilities and Infrastructure

Preparation of training facilities and infrastructure. This preparation includes the provision of facilities and infrastructure for training and counseling.

Implementation Stage

General presentation of types of waste, Introduction to organic waste management methods, Demo of making eco enzyme, Explanation of the benefits of eco enzymes in various fields.

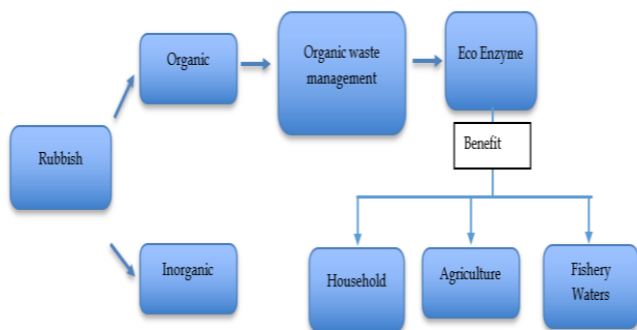


Figure 2. Waste management implementation chart

Monitoring and Evaluation Stage

Making Eco Enzyme takes approximately three months from the start of manufacture. Therefore, monitoring and evaluation is needed so that the process of making eco enzyme runs smoothly.

Evaluation Stage

Evaluation is carried out in line with monitoring, so that if there are problems they will be resolved immediately. Guiding partners to remain consistent in making eco enzyme into a liquid that is ready for use.

Partner participation in activities

This Community Service is located in Pulai Anak Air Bukittinggi Village, West Sumatra.

Target Audience

The target audience for this community service activity is people who are members of the PKK and Pokdarwis groups, Pulai Anak Air Bukittinggi Village, West Sumatra. The people invited to this training activity according to the title of the PKM activity are housewives who are members of the PKK and Pokdarwis Groups in Pulai Anak Air Bukittinggi Village, West Sumatra.

Type of Activity

In overcoming the problems that occur in partner communities as previously described, the Community Partnership Program offers several approach methods that can help in resolving existing problems, namely by conducting counseling methods in waste grouping and training in making Eco Enzyme from organic waste so that groups Housewives can minimize the disposal of organic waste to landfill (Ismiraj et al., 2023).

Result and Discussion

By the aim of implementing this community service activity, after carrying out the activity it is hoped that the community members of the PKK and POKDARWIS

groups will have increased abilities in terms of sorting and managing organic waste. Then you can also increase your understanding in terms of understanding aspects of making Eco Enzymes. An overview of the implementation and results achieved in the community service activities that have been carried out is described in the following explanation.

Table 2. Initial Community Service Activities

Date	Activity	What to expect
August 12, 2023	Processing of Community Service Permits in Pulai Anak Air Bukittinggi Village	Issue a letter of recommendation for approval to carry out activities
September 12, 2023	Community service activities are carried out	Implementation of community service to mothers and fathers who are members of POKDARWIS and PKK
September 19, 2023	Initial checking with the results that have been carried out	People open the lid of the Eco-Enzym container to reduce the gas present
December 12, 2023	Monitoring in Pulai Anak Air Village	Harvest Eco-Enzymes which can be used by the community
December 13, 2023	Evaluation of Eco-Enzyme Harvest	Success from the results of activities that have been carried out

After all the community service preparations were completed, the team then completed the preparations and prepared the materials for the process of making Eco Enzymes in Cupak and Lower Silaing. The following is a list of tools and materials used for manufacturing. Eco Enzyme was first introduced by (Mulyono et al., 2022) Poompanvong who is the founder of the Thai Organic Farming Association. The idea of this project is to process enzymes from organic waste that we usually throw in the trash as an organic cleaner (Sahoo et al., 2023).

Table 3. Tools and Materials

Material	Tool
Organic waste (vegetables and fruit)	Closed container (25 L)
Palm sugar	Scales
Water	Measuring cup
Masking tape	Big mixer
Tissue	
HVS A4 paper	
Whiteboard marker	
Mineral water	
ATK	
Plastic	



Figure 3. Tools and materials

Eco enzyme is a liquid extract produced from fermenting leftover vegetables and fruit with brown sugar as a substrate (Verduzco-Oliva & Gutierrez-Urbe, 2020). The principle of the process of making eco enzyme itself is similar to the process of making compost, but water is added as a growth medium so that the final product obtained is in the form of a liquid which is preferable because it is easier to use (Permatananda et al., 2023). Eco Enzyme can be a multi-purpose liquid and its applications include households, agriculture, and animal husbandry (Benny et al., 2023a). Eco enzymes accelerate bio-geochemical reactions in nature to produce useful enzymes using fruit or vegetable waste.

Implementation of Training on Organic Waste Processing and Making Eco Enzymes

This training activity on waste processing and making Eco Enzymes was carried out in Pulai Anak Air Village. The implementation of community service with the title Community Empowerment in Organic Waste Management is based on the service team's awareness of the importance of helping the community to truly have the ability to process the organic waste produced (Taelman et al., 2018). So that waste does not accumulate and can save costs from Eco Enzymes which can be used for many benefits, one of which is natural fertilizer (Fadlilla et al., 2023). The enthusiasm and enthusiasm of the participants in the activity were directly involved in practicing the processing of waste generated from their respective activities (Perkumienè et al., 2023). These ladies and gentlemen will organize a group to collect organic waste from leftover vegetables and fruit, each of which will be put together and then processed into Eco Enzymes.

This community service has been carried out by Pulai Anak Air Subdistrict using 2023 UNP PNBPF funds

which in general has been carried out very well. In its implementation, ladies and gentlemen were very enthusiastic and happy with training like this. There are several important notes from the implementation of this service that need to be of concern to various parties: The community feels great benefits from this service. This was revealed from the service team's interviews with participants (Knott et al., 2022). The community is very enthusiastic about taking part in this training because they cannot yet process organic waste into items that are very useful for their daily needs (Dwivedi et al., 2023).



Figure 4. Participant's practice directly making eco enzyme

Usually, the waste is immediately thrown away and becomes a pile of rubbish; Training on making Eco Enzymes does not require time and energy in the manufacturing process. So it will not interfere with community activities. The benefits of Eco Enzyme will be greater than are not yet known to the public, such as house cleaning (Nurlatifah et al., 2022), vegetable and fruit cleaning, mouthwash, watering flowers, fertilizing plants, and many other benefits. (Benny et al., 2023b); Waste management method that uses agricultural residues for something very useful (Sadh et al., 2018). This liquid can be used as a house cleaner, as well as an effective natural fertilizer and pesticide (Hadipramana et al., 2023). From the first day, the Eco Enzyme fermentation process will release ozone gas (O_3) (Nur Anisa et al., 2022). O_3 can reduce carbon dioxide (CO_2) in the atmosphere which traps heat in clouds. So it will reduce the greenhouse effect and global warming. Enzymes convert ammonia into nitrate (NO_3), a natural hormone and nutrient for plants (Li et al., 2013). Meanwhile, it converts CO_2 into carbonate (CO_3) which is beneficial for marine plants and marine life (Renforth & Henderson, 2017).

Conclusion

This Community Partnership Program uses counseling and training methods for making Eco

Enzyme from organic waste so that community groups in the Pulai Anak Air Bukittinggi sub-district can manage organic waste into fertilizer, cleaning, etc. The activity stages begin with the preparation stage, the implementation stage, and end with the monitoring and evaluation stage. The output targets to be achieved include articles, activity videos, liquid fertilizer, cleaners, etc. which can be used by the community, especially the PKK and Pokdarwis groups in Pulai Anak Air Bukittinggi Village.

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Author Contributions

Conceptualization, W. P., D. N., S. M., D. L., V. A. P.; methodology, W. P.; validation, D. N. and S. M.; formal analysis, D. L.; investigation, V. A. P., and W. P.; resources, D. N. and S. M.; data curation, D. L.: writing—original draft preparation, V. A. P and W. P.; writing—review and editing, D. N.: visualization, and S. M. and D. L. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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