

Ecoenzyme Based Recycle Method from Pineapple Peel Waste to Realise an Environmentally Friendly Green Economy

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Abstract: This research aims to improve human welfare and social justice by minimising the impact on the environment. One of the problems faced is pineapple fruit peel waste, which has not been optimally utilised at all and is often just dumped into gardens or waters, causing environmental pollution such as unpleasant odours and groundwater damage. Solid waste mixed with other waste can produce leachate that seeps into the soil and contaminates underground water. The main factor causing this condition is the lack of knowledge and skills of the community in effectively treating pineapple peel waste. **Methods** This research focuses on processing pineapple peel waste into ecoenzymes as an environmentally friendly recycling solution. The results showed practical solutions in organic waste management, reducing environmental pollution, and creating new productive business opportunities and giving birth to environmentally friendly and sustainable commercial opportunities. The recycle method not only addresses environmental issues, but also advances social aspects by providing new skill opportunities to the Community, thus providing productive and commercial activities.

1 INTRODUCTION


This research aims to improve welfare and social justice through optimal utilization of pineapple peel waste, emphasizing on reducing environmental pollution (e.g., preventing groundwater pollution) and creating new economic value for the surrounding community. In this way, the research objectives support the principles of a sustainable green economy. The target of the Sustainable Development Goals or Sustainable Development pillar 12 on responsible consumption and production is currently under-recognized.


It can be seen that when production and consumption activities take place, it will definitely produce waste, both organic and inorganic. If the waste from production and consumption activities is not managed properly, it will later cause various new problems for both humans and the surrounding environment. Indonesia as an agricultural country has good horticultural potential, including many tropical fruit commodities (Rahmadhanti et al., 2022). One of the superior commodities is pineapple (Ananas


Comosus L). In West Java itself, the largest pineapple commodity is at 92% which is produced in the Subang area (Luthfi et al., 2022).

According to data from the Subang Regency Statistics Agency and data that has been submitted by the Regent of Subang, H. Ruhimat, he said that in 2023 pineapple land in Subang will reach 3,171.4 Ha where 1 hectare of pineapple can produce 10 to 15 tons of pineapple. In one year, the maximum limit for pineapple production is at 2960,000 tons. The large number of pineapple lands in Subang is of course also due to the large market demand considering that pineapple is a fruit that is rich in content and can be processed into various culinary delights such as pineapple jam, dodol, and others (Helilusiatiningsih et al., 2021).

According to agriculture data (2023), pineapple peel waste can reach 40% of the total weight of pineapples produced, resulting in millions of tons of organic waste each year worldwide. In Subang Regency, West Java, pineapple production reaches up to 2,960,000 tons per year, resulting in around 800,000 tons of pineapple peel waste that has not

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been optimally utilized. This data shows the importance of pineapple peel waste management to reduce environmental impacts. However, there is something that is less considered by pineapple business owners, when they clean pineapples from their skin. Usually pineapple skin will be thrown away in vain on empty land (Noviana et al., 2019).

According to Nurhayati (2013), pineapple processing activities produce pineapple peel waste of 27% of the total pineapple production, so that the pineapple peel waste produced reaches 5.12 tons/ha of harvest area. Of course, if left unchecked, it will cause new problems considering that pineapple peel is organic waste that takes some time to decompose. Pineapple peel waste that is left to pile up can cause an unpleasant odor which will later disturb the comfort of local residents and pollute the environment (Prasetyo, 2021). In fact, if managed properly, discarded pineapple peel can be processed into a product that is useful and needed by the community.

The solution to this problem can be done by processing pineapple skin waste into ecoenzyme liquid. Ecoenzyme is an environmentally friendly liquid produced from the fermentation of household organic waste such as fruit and vegetable waste mixed with several additional ingredients such as water (Marmi et al., 2023). Ecoenzyme is also considered effective and economical because it does not require a large space and cost (Nurfajriah et al., 2021; Saifuddin et al., 2021). Ecoenzyme liquid processed from pineapple peel waste can be used as an ingredient to make various environmentally friendly household products. One of the products we offer as a solution to this problem is EnPineas. EnPineas stands for Environment Pineapple Soap. This product is a new innovation that we carry from processed ecoenzyme liquid from pineapple peel waste in the form of hand soap. EnPineas is not only a hygienic and clean household product for consumers made from natural ingredients, but also an environmentally friendly product with little foam to maintain cleanliness and sustainable natural stability.

2 RESEARCH METHODS

This study uses a qualitative descriptive approach with a participatory training method. The purpose of this study was to describe the increase in knowledge and skills of participants in managing pineapple peel waste through the manufacture of ecoenzymes. Training in processing pineapple peel waste into ecoenzymes was carried out through a two-day

workshop where participants were taught basic fermentation techniques. Introduction to raw materials, Fermentation process, Ecoenzyme application.

The materials studied include introduction to raw materials, fermentation processes, to the application of ecoenzyme products. A total of 50 participants in Subang Regency, Kasomalang Kulon District, including business owners and housewives, participated in this training, which has improved their ability to manage waste effectively. Data collection process Direct observation, pre- and post-training questionnaires, and interviews. While data analysis Data obtained from questionnaires, interviews, and observations were analyzed qualitatively with a thematic analysis approach. Researchers identified the main themes related to improving knowledge, skills, and application of ecoenzyme products in the participants' environment.

3 DISCUSS

Ananas comosus L or what we are familiar with as pineapple is one of Indonesia's plant commodities that has great potential to be developed because it has many benefits. One of its contents is that it contains a lot of vitamin B12, vitamin C, vitamin E and bromelain enzymes which are very much needed and good for the human body. In addition to the fruit, pineapple skin also has good content, namely bromelain enzymes, carotenoids, vitamin C and flavonoids (Putri, 2020). The flavonoid content in pineapple skin can be used as an antioxidant, anti-allergic, anti-inflammatory, and anti-bacterial. Pineapple skin also has antioxidant content that can be used as a skin layer protector because it can prevent free radicals and can be applied in the form of anti-fishy odor hand soap products.

Along with the development of technology and science in society, pineapple skins that were previously considered trash by society can now be processed into products rich in benefits, one of the products we process is hand soap. Why is it called environmentally friendly because, the process of processing pineapple skins becomes something useful, on the other hand there will also be minimal foam produced so that it can reduce water pollution. Subang as one of one of the largest pineapple producing areas in West Java has also given birth to many new businesses in various fields such as culinary. However, pineapple skin waste is often not managed properly. Therefore, we collaborate with one of the owners of a fairly large pineapple

plantation in Subang, a plantation owned by Mr. Kartono located in Kasomalang Kulon, Subang, which will be our partner in the future. Pineapple skin obtained from the remaining business owned by Mr. Tono's pineapple plantation will be processed into environmentally friendly products that are useful for household activities with new innovations that are in line with Sustainable Development Goals points 12 and 15. In production activities, we will produce EnPineas in an amount of 10L. Here are the steps for making EnPineas (Environment Pineapple Soap):

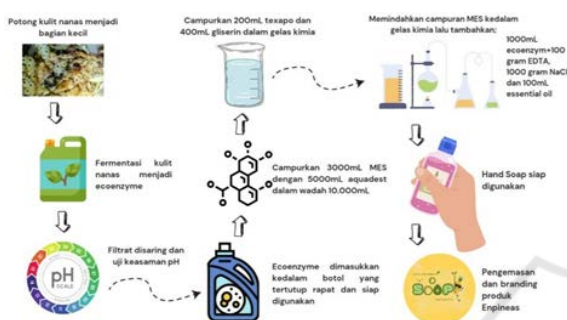


Figure 1.

The steps for making ecoenzyme consist of:

- Raw materials: pineapple skin, brown sugar, and water in a ratio of 3:1:10.
- Process: Fermentation is carried out in a closed container for three months, with stirring every two weeks.
- Results: The final product in the form of ecoenzyme liquid can be used immediately.

Based on the trial, every 10 kilograms of pineapple peel can produce 5 liters of ecoenzyme and reduce organic waste by 50%. The environmental impacts include a decrease in unpleasant odors and a decrease in BOD (Biochemical Oxygen Demand) levels in the trial area by 40%. The program has supported Government Regulation No. 81 of 2012 concerning Waste Management and the National Waste Management Strategy. In addition, this solution can be integrated with regional organic waste management programs to create a circular economy. One of the main challenges is the consistent availability of raw materials. To overcome this, waste management can be expanded through collaboration with more local farmers. In addition, large-scale management requires more investment in fermentation infrastructure.

4 CONCLUSIONS

The ecoenzyme-based recycling method of pineapple peel waste provides an innovative solution to address environmental challenges while creating new economic value for the community. This waste processing process not only helps reduce pollution, such as water pollution and bad odors, but also produces value-added products such as environmentally friendly cleaning fluids and hand soaps. In addition, this activity supports community empowerment through skills training, thereby increasing their capacity to manage organic waste effectively. This study shows that every 10 kilograms of pineapple peel can produce 5 liters of ecoenzyme, with the potential to reduce organic waste by up to 50%. This program is in line with sustainable development goals, especially on responsible consumption and production, as well as protection of terrestrial ecosystems. Challenges such as consistency of raw material supply and scale of production can be overcome through collaboration with local communities and investment in infrastructure. With an environmentally friendly and cost-effective approach, this method has the potential to be widely applied to support a sustainable green economy.

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