

## **ENVIRONMENTAL ACCOUNTING; AN OVERVIEW UTILIZATION OF ECO ENZYME FOR TREATMENT NAIL AND MOUTH DISEASES (NMD) OF COWS IN MALANG**

Jamaluddin<sup>1</sup>

Sri Mintarti<sup>2</sup>, Rita Damayanti<sup>3</sup>, Randhi Akhdiyati<sup>4</sup>, Sonhaji<sup>5</sup>

<sup>1,2,3,4</sup>Universitas Mulawarman

email: jamaluddin@feb.unmul.ac.id

### **ABSTRACT**

**Purpose** – This study aims to determine the effectiveness of using eco-enzymes for treating nail and mouth disease (NMD) in cattle from the perspective of environmental accounting. This eco-enzyme is produced by fermenting household organic waste, sugar, and water. Eco Enzyme is environmentally friendly and helps improve environmental quality.

**Methodology** – This type of research uses mixed methods with a case study approach. The innovation perspective is carried out as a strategy to understand the problems. In addition, in-depth interviews and direct observations were conducted to understand the application of eco enzymes and calculate the cost of goods.

**Research findings** – This study shows that using eco-enzymes to treat NMD is effective and efficient. That can be seen from the cure rate for NMD treated with eco-enzymes, which reaches 100%. Things contribute to this problem.

**Practical implications** - Using eco enzymes is highly recommended for treating foot and mouth diseases. It educates the public to use organic treatments and protect the environment by using eco enzymes.

**Originality** – This research was conducted in Malang Raya, an area impacting foot and mouth disease in Indonesia. It is hoped that preventing and treating foot and mouth disease using an eco enzyme in Malang can become a pilot project to overcome nail and mouth disease in Indonesia. They are because eco enzymes are an effective, efficient, and environmentally friendly solution.

**Keywords:** Eco enzyme, nail and mouth disease (NMD), environmental accounting, and organic waste.

**Paper type** — Case study

### **INTRODUCTION**

Conventional accounting focuses on earning a company's profits. That becomes a dilemma in using nature companies as a resource that continues to be utilized to gain profit (Schaltegger and Burritt 2000). If this continues, it will impact the environmental damage felt by humans. Therefore. Accounting should focus on obtaining profits and sustainable development (Barbier and Burgess, 2017).

Humans, as the subject of development, have different behaviors. Some care about the environment, and of course, some do not care about the environment. Therefore, education about the importance of sustainable development must continue to be echoed. The presence of garbage always accompanies the existence of humans.

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<sup>1,2,3,4</sup> Faculty of Economics and Business, University of Mulawarman, Samarinda, East Kalimantan.



<sup>5</sup> Malang Kucecwara College of Economics, Malang, East Java.

As the human population increases, waste production also rises. That has an impact on global warming because waste produces methane gas (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), nitrogen dioxide (N<sub>2</sub>O), and ammonia (NH<sub>3</sub>) (Johnke, B. 2000).

Sources of waste include household waste. *Eco enzyme* is present as a solution to reduce organic waste. *Homemakers quickly make eco enzymes* because the raw materials are easy to find and the manufacturing process is not complicated. The main ingredients for *eco enzymes* are brown sugar, fruit peels, and water. For fruit peels thrown away or underutilized so far, the presence of *eco enzymes* can be a solution to reduce organic waste disposed of in landfills (DIL).

The explanation above can be drawn as a red thread or the relationship between environmental accounting and *eco enzymes*. Ecological accounting can be used to calculate the efficiency and effectiveness that occurs by using *eco enzymes*. NMD treatment by utilizing *eco enzymes* can also be calculated for its efficiency and effectiveness compared to medical treatment as far as it is known. The advantages and disadvantages of using *eco enzymes* are also discussed in this study. Dascalu et al. (2010) explained that environmental accounting information could be used to decide better future ecological policies. To understand why this research was carried out, the following describes global ecological conditions due to waste management that does not care about ecosystem balance.

Carbon dioxide is the most significant contributor to global warming due to burning waste, compared to other gas emissions. Herlambang, Sutanto, and Wibowo (2016) explained that 45 big cities in Indonesia produce 4 million tons of waste annually. Methane gas produced can reach 11,390 tons of CH<sub>4</sub> per year. That is equivalent to 239,199 tons of CO<sub>2</sub> per year, or 64% of the total waste emissions from 10 big cities in Indonesia.

Besides waste, CO<sub>2</sub> production is closely related to using fossil fuels, namely coal, oil, and natural gas. Fossil fuels currently provide around 85% of the world's energy supply. That implies that future emissions depend on future human populations, global economic growth, and the type of economic activity carried out. The only way to produce less CO<sub>2</sub> from fossil fuels is to use less (LD Danny Harvey, 2016). However, the discussion in this paper is more focused on managing organic waste to reduce greenhouse gas emissions.

Garbage is a source of problems for the environment if not managed properly. Therefore, waste must be appropriately managed so as not to cause problems in the future. This waste management starts from the household to the final disposal site (DIL). However, before this waste reaches the DIL, treatment can be carried out on the litter to reduce it to its final destination (Astuti et al., 2020). That needs to be done, bearing in mind that the landfill will also be complete at some point. So, from an early age, a solution must be considered so that waste does not always have to be disposed of in the DIL. That will extend the life of the landfill. That means that the DIL will be able to function longer.

Garbage can be grouped into two parts, namely solid waste (inorganic) and wet waste (*organic*). Inorganic waste is material that comes from non-animals or non-plants. Soil microorganisms do not quickly decompose this inorganic waste. Inorganic waste will take a long time to be spoiled by soil microorganisms. It takes decades to decompose. Therefore, inorganic materials should not be disposed of carelessly so as not to cause environmental pollution.

Organic waste is material that comes from animals or plants. The nature of this organic waste is not durable and quickly causes an unpleasant odor. Therefore, this organic waste also requires good handling so as not to cause odor pollution. Compared to inorganic waste, soil microorganisms easily break down organic waste.

Management of organic waste has been carried out by the community, both in groups and individually. Handling organic waste provides added economic value, including the manufacture of compost, biogas, liquid organic fertilizer (LOF), etc. However, researchers will discuss handling this organic waste, especially household waste, to manufacture *eco enzymes* in dealing with nail and mouth disease (NMD).

Leestyawati (2022) explains that in 1990, Indonesia was declared free of foot and mouth disease as stated in the OIE ( *Office International des Epizooties* ) resolution Number XI of 1990. This OIE organization is the World Organization for Animal Health, founded in Paris in 1924. In 2013, Through the Ministry of Agriculture, the Government of Indonesia issued a Minister of Agriculture Regulation stating that NMD is a strategic infectious animal disease (PHMS) that must be watched out for and prevented (Ministry of Agriculture Regulation 2013). Furthermore, Leestyawati (2022) stated that in 2019, Indonesia was again declared free from foot and mouth disease by the OIE with resolution XV 2019.

On May 5, 2022, PUSVETMA (Center for Veterinary Farma) stated that Indonesia was no longer accessible from NMD due to several NMD cases in East Java. NMD spread quickly to 15 provinces (Khansa 2022). NMD virus has an incubation period of 2 days to 14 days. This NMD worries the community because it appears ahead of the Eid al-Adha 1443 H or the sacrifice day in the second week of July 2022.

Data from the Ministry of Agriculture on May 17, 2022, states that NMD has spread to 17 provinces and 52 districts/cities in Indonesia. The cattle population in the 15 provinces is 13.8 million head. The number of cattle affected by NMD is 3.91 million head. Cattle infected with NMD were 13,965 heads or 0.36 % of the total affected. Two thousand six hundred thirty cows recovered, or 18.30 %. At the same time, the dead cows were 99 heads or 0.71% (Gunawan, 2022). However, the number of those affected, infected, recovered, and died continues to grow daily.

Media Indonesia, on July 2, 2022, reported that 298,474 livestock had been infected with NMD in 223 regencies/cities in 19 provinces. However, the Indonesian Cattle and Buffalo Breeders Association (PPSKI) said the number of those infected was far greater than the government's data. According to PPSKI, cattle infected with NMD can reach ten times the number from government data. That forced the government to establish a particular state of emergency against the spread of NMD (Seno, 2022).

Amid the concerns of the community and livestock owners, there is great hope for a cure for NMD. NMD treatment using *eco enzyme* is a new thing. In addition, the *eco enzyme* is made from environmentally friendly kitchen waste. Treatment with *eco enzyme* is a low-cost treatment and faster healing than medical treatment. The discovery of NMD treatment with *eco enzyme* made people happy, especially livestock owners.

*Eco enzyme* results from fermenting organic kitchen waste from various kinds of fruit peels, vegetable scraps, brown sugar, and water (Pratiwi, 2022). *Eco* This *enzyme* is very cheap because it only uses kitchen waste with little skill to prepare it. It cannot be made quickly because it takes at least 3 (three) months for the fermentation process before it is used.

Studies have been carried out on *eco enzymes* with various uses, including those by Hemalatha and Visantini (2020), which discuss the potential use of *eco enzymes* for metal-based waste treatment. This research provides a solution to prevent sludge disposal to ensure a clean environment. Then, the study of Galintin, Rasit, and Hamzah (2021) discusses the production and characterization of *eco enzymes* produced from fruit and vegetable waste and their effects on cultivation sludge. The study results recommend using *eco enzymes* as an environmentally friendly solution to reduce the composition of food waste in solid waste generation and have the potential to be applied to the wastewater industry.

The outbreak of NMD is a problem that must be resolved, especially since the spread is so fast, with a high mortality rate. The NMD phenomenon is similar to the COVID-19 pandemic. At the beginning of its reach, it received little attention from the parties involved, so it spread quickly. Tests on cattle with a slow impact were carried out (Seno, 2022).

The use of *eco enzymes* for treating NMD in cattle is something new. NMD cases have spread, which worries many parties, especially cattle breeders and owners. Apart from worried cattle breeders and owners, beef consumers are also concerned. NMD is feared to be transmitted to humans. That prompted researchers to conduct this research.

Research on the use of *eco enzymes* for the treatment of NMD will be seen from the economic, effectiveness, and efficiency perspectives. This research was conducted in Malang, considering the crime scene was in Malang. The definition of crime scene means treating cows with *eco enzyme* infected with NMD, mainly done in Malang. The rise of NMD treatment using *eco enzyme* is because *Malang has formed a community of eco enzyme volunteers*. This community is active in socializing the manufacture and application of *eco-enzyme utilization* in various uses.

Research on the use of *eco enzymes* for NMD treatment is part of environmental accounting research. So far, ecological accounting research has generally been carried out in large companies. Most studies identify company costs related to their concern for the environment (Schaltegger and Burritt, 2000). This environmental accounting also aligns with the United Nations (UN) protocol regarding *Sustainable Development Goals (SDGs)*.

Based on the description above, the authors conducted a more in-depth study to see the effectiveness of *eco enzymes* in treating cattle NMD in Malang from an environmental accounting perspective. Malang was chosen as the research location because it was in that area that there were NMD cases treated with the *eco enzyme*. The first research question is: how effective is the use of *eco enzymes* for the treatment of NMD in cattle in Malang from an environmental accounting perspective? Second, what are the advantages and disadvantages of using *eco enzymes*? Moreover, third, what is the cost of making *eco enzymes*?

This study aimed to determine the effectiveness of *eco enzymes* for treating NMD in cattle in Malang from an environmental accounting perspective. The second is knowing the advantages and disadvantages of using *eco enzyme*, and the third is knowing the cost of making *eco enzyme*.

## LITERATURE REVIEW

Environmental accounting considers environmental costs resulting from the activities of companies or government agencies. These ecological costs have monetary and non-monetary impacts (Schaltegger and Burritt 2000, p. 45). Applying environmental accounting helps companies reduce ecological problems that may be encountered in the future. The purpose of implementing environmental accounting is to increase the efficiency of environmental management in the future. That can be done by assessing environmental activities regarding economic benefits and ecological costs (*United Nations*, 2015).

Environmental accounting will contribute to the goal of sustainable development. The UN has also echoed this due to increasing environmental damage due to growth that ignores the environment. Ecological damage can result in disaster for humans. Global warming has the potential to occur, which will cause the melting of icebergs at the North Pole and South Pole (Straneo *et al.* 2012). If this happens continuously, it will result in the sea level rising. That means that many islands are threatened with sinking.

No matter how small, human concern for the environment will contribute to environmental improvement and have multi-monetary and non-monetary effects. Ecosystem accounting has been designed to help decision-makers concerning ecological improvement (*United Nations*, 2022). Likewise, households cannot be separated from waste. Families produce various kinds of waste, and this will also contribute to global warming. However, household waste can be reduced by processing the waste into *eco enzymes* (Galintin *et al.*, 2021).

Global warming has threatened the future of the Earth. That means that the end of our children and grandchildren is also threatened. Therefore, world leaders urge real action against climate change. A meeting of 130 world leaders at the 26th Summit on Climate Change was held in Glasgow, Scotland, from 1 to November 11, 2021. This meeting is the 26th COP26 (Climate Change of Parties) (Herman, 2021).

Global warming is solar radiation energy that warms the Earth's surface and thermal radiation from the Earth and atmosphere that is emitted into space. These two radiation streams must be balanced. The greenhouse effect arises because of greenhouse gases in the atmosphere, which absorb the thermal radiation emitted by the Earth's surface and act as a blanket over the surface (Houghton, 2005). Meanwhile, global warming is an increase in the Earth's temperature because heat from the sun cannot be reflected outside because of greenhouse gases that block it in the atmosphere.

In conclusion, global warming is an increase in temperature on the Earth's surface because radiation from the sun's rays cannot be reflected out due to being blocked by various atmospheric gases. This condition is called the greenhouse effect.

A greenhouse, in general, is a building whose roof and walls are made of glass. The goal is that the solar market that enters the house can be restrained so the temperature remains warm at night. So, the greenhouse meant here is not a real house, namely a house made of glass. According to, the greenhouse effect is the increase in the temperature of the Earth's surface due to the trapping of long-wave sunlight by greenhouse gases in the atmosphere.

Alexey Mikhaylov, Nikita Moiseev, and Kirill Aleshin (2020) stated that the climate is changing significantly due to human behavior. This climate change has many consequences for human health around the world. Meanwhile, (Kweku *et al.* 2018) state that the greenhouse effect is the main factor in keeping the Earth warm because it keeps some of the planet's heat that should escape from the atmosphere into outer space. The existence of the greenhouse effect is what makes the Earth a comfortable place for life. The study also reveals the importance of greenhouse gases to planetary warming. Without the greenhouse effect, Earth's global average

temperature would be much colder, life on Earth would not exist, and humans would not be able to live in these conditions. Garbage is a source of global warming.

Garbage is goods or objects discarded because they are no longer used (2016 Language Development and Development Agency). Meanwhile (Law No. 18 of 2008) regarding waste management defines waste as the residue of daily human activities and natural processes in solid form. In addition, Koskela, Bølviken, and Rooke (2013) explained that waste comes not only from households and nature but also from industry-generated waste.

Waste can be distinguished based on its nature, namely solid waste and liquid waste. Solid waste is the remains of human activities in a tangible form that are no longer used and are difficult to decompose by microorganisms. This type of waste is used in plastic, cans, glass, etc. Meanwhile, liquid waste is the remains of human activities that are liquid and easily broken down by microorganisms. This type of waste is plant and animal waste, for example, kitchen scraps, fruit peels, vegetable scraps, fish innards, and so on (Sulistiorini 2019).

Kitchen waste is one of the essential ingredients for the manufacture of the *eco enzyme*. Muliarta and Darmawan (2021) explained that *Eco enzyme* is an organic compound in the form of a complex solution produced from the fermentation process of kitchen waste materials in the form of fruit peels and vegetable waste. The term *eco enzyme* was initiated by Rosukon Poompanvong, a founder of *the Organic Agriculture Association*, Thailand, who has been conducting research since the 1980s. Naturopathic Researcher from Penang, Malaysia, Joean Oon, introduced the term more broadly.

*Eco enzymes* can be used in various ways, including treating NMD. The use of *eco enzymes* can be seen from the economic side, effectiveness, and efficiency. Mardiasmo (2002) explains that economics is getting the cheapest input from various alternatives at a certain quality. Effectiveness is the achievement of output according to predetermined targets. While efficiency is the best output with a piece of particular information, it can also be said that efficiency is the ratio of work to input (output/input) about predetermined standards.

*The eco enzyme* can be made on a large or small scale. Homemakers can do small scale. The cost of producing this *eco enzyme can be calculated simply by calculating the cost of goods in general*. The cost of production is the total cost incurred until the product is sold or ready for use. Production costs include raw materials, labor, and *overhead costs* (VanDerbeck 2013).

## RESEARCH METHODOLOGY

This research type is a mixed *method* with a case study approach. *The mixed method* answers research questions because two research questions must be done with quantitative methods, even simply. At the same time, the second research question needs to be answered with qualitative methods. The advantage of the *mixed method* approach is that quantitative research results can be generalized while the effects of qualitative research can provide broad insights (Zhang and Watanabe-Galloway, 2014).

A qualitative approach is used in social research to understand the phenomena experienced by informants. The informants can be individuals or communities in society (Creswell 2009). In addition, a qualitative approach is used to reveal the experiences and feelings of informants by asking some questions and procedures related to using *eco enzymes* in treating NMD in cattle breeders.

Researchers triangulated to clarify informants' answers. This triangulation is a technique for checking the validity of the data that researchers have collected by comparing the results of interviews with other informants

and research objects. Triangulation is a technique for combining information from various parties and various ways of collecting data from multiple data sources. Triangulation can be done in different types: data, reference, theoretical, and time. The purpose of this triangulation is to test credibility so that the data collected is only accurate data.

The researcher also conducted a *Focus Group Discussion* (FGD) to help interpret the interim research results. That is intended to obtain adequate confidence in the various things found during field research. The FGD was attended by Malang Raya *eco enzyme* (REMR) volunteers. REMR comes from multiple ethnicities, religions, and professions. They were put together in an *eco-enzyme* volunteer forum to educate the public regarding *eco-enzymes*.

The mixed method is chosen because the researcher aims to fully and in-depth describe the reality of using the *eco enzyme* to treat NMD in cattle compared to using only one method. The mixed method research method aims to explain society's facts and social phenomena so that a phenomenon's characteristics, characteristics, and models can be clearly described.

The strategy used by researchers in research is to identify the nature and experiences of informants. That follows Creswell's (2009) explanation that a qualitative strategy is a research strategy for determining the nature and experiences of informants about a particular phenomenon. Therefore, in this study, researchers will try to put aside the personal experience of researchers in understanding informants' experiences in using the *eco enzyme* to treat cattle breeders. Using *the mixed method will enrich the understanding* of the research problem (Tariq and Woodman, 2013).

The source of research data is primary data. Researchers conducted surveys, observations, and direct interviews with the primary source, namely cattle breeders. These cattle breeders care for their cows daily by feeding, drinking, and cleaning the stables. Researchers also used secondary data in the form of current information about foot and mouth disease. Researchers also collected data from various online media to determine the number of cows infected with NMD and the number of cows that died from NMD.

To determine the effectiveness of using *eco enzyme* for the treatment of NMD, the formula for the number of cows treated divided by the number of cows that recovered is multiplied by 100%. Meanwhile, to find out the cost of production of *eco enzyme* is to collect all the expenses used to produce the *eco enzyme*. *The production costs are in the form of raw materials, labor, and overhead costs*. A qualitative approach was used to determine *eco enzymes'* advantages and disadvantages, namely surveys, interviews, and FGDs.

## **RESEARCH RESULTS AND DISCUSSION**

### **Research Location Profile**

This research was conducted in two locations: the first was in Dusun Kuso, RT 02, RW 08, Kalisongo Village, Dau District, Malang Regency, East Java Province. Both RT 5, RW 8, Karangates Village, Sumberpucung District, Malang Regency, East Java Province. The choice of this research location was because both locations had NMD cases. However, there are also several NMD cases in other areas in East Java Province. The first location belongs to BS, a research colleague with the initials recommended AH. Please note that this AH

produces *eco enzymes* used in BS farms. In contrast, the second location belonged to an elementary school that colleagues from Malang Raya *eco enzyme* volunteers recommended.

BS had 17 cows before the outbreak of NMD. However, when the study was conducted, only seven cows remained. Ten cows were sold ahead of Eid al-Adha 2022. The remaining seven cows, 5 of which have NMD indications. 2 cows are still healthy, and it is estimated that they will be infected with NMD if they are not handled properly in the next few days. At the same time, SD had 12 cows when this research was conducted. Initially, 2 of his cows had NMD indications, but within four days, all had NMD indications.

## **Results and Discussion**

### **The Effectiveness of Using *Eco Enzyme* for NMD Treatment, viewed from an environmental accounting perspective**

The spread of NMD makes farmers shrouded in anxiety. They imagine by them the loss in front of their eyes. Media reports about NMD add to the concerns of the farmers. What is more, they have reported the condition of their cows to health workers but have received little response. This condition is like the beginning of COVID-19, and medical personnel seem confused. Limited veterinary medical personnel, limited medicines, and comprehensive area coverage make it difficult for veterinary medical personnel to receive many public complaints.

During the confusion, the breeders raised their creativity to find solutions for treating NMD. Some use human medicines such as borax to reduce cow fever. Some use traditional ingredients such as turmeric, ginger, and lemon, commonly known as *empong-empong* (spice). Some use wound medicine, sodium, herb oil, etc, to treat nails.

*Eco enzyme* volunteers initially initiated using *eco enzymes* for treating NMD because of limited drugs and the absence of a protocol for handling NMD. Based on the researcher's interview with the Malang Raya *eco enzyme* volunteer community, information was obtained that the idea for this use originated from the explanation of the Vet. Indro Cahyono (VIC) is a researcher of all kinds of viruses. VIC explained that the virus is not resistant to hot, salty, and acidic water. Based on VIC's explanation, REMR uses *eco enzymes* for NMD treatment because these *eco enzymes* are acidic. In addition, the *eco enzyme* has also been used to treat various skin diseases.

The search results of researchers in cyberspace show that the news about using *eco enzymes* to treat NMD was first released by Dahlan Iskan (DI). DI is a senior journalist and *owner* of the Jawa Pos Group. DI was released on Monday, May 23, 2022. After the release of DI, many farmers began to use *eco enzymes* to treat NMD. Before being fired by DI, many breeders did not believe that *eco enzymes* could be used for NMD treatment.

A farmer with the initials PW initially refused to use *eco enzymes* for NMD treatment in his cows. The reason is that they have bought the medicines the veterinary medical personnel recommended. It is pretty expensive, the price is more than a million. However, these drugs did not help much; some of PW's cows eventually died, and some were forcibly slaughtered. After some of PW's cows died, were forcibly killed, and saw other breeders' cows using *eco enzyme*, they recovered. Finally, PW wants to use the *eco enzyme* to treat NMD in his cows.

Using an *eco enzyme* to treat NMD in cattle on BS and TM farms does not show 100% success. Cattle infected with NMD on day two after treatment have started to be able to eat. Likewise, the researchers traced other



cows in farms attacked by NMD, treated with *an eco enzyme*, showing 100% recovery. NMD treatment with *eco enzyme* is a possible first treatment in the world. Researchers' search in cyberspace did not find this in other countries.

Mr. Nasrullah, Director General of Livestock and Animal Health, Ministry of Agriculture. He explained that up to August 31, 2022, since the outbreak of NMD, 7,718 livestock had died. Most of the deaths suffered by West Java, as many as 3,340 tails. This total death is 0.04% of Indonesia's natural cattle and buffalo population, around 18 million to 19 million (Litha 2022).

The number of deaths of cattle and buffaloes, which amounted to 7,718 heads, is indeed only a tiny number, especially if they look at the percentage, which is only 0.04%. They get a considerable number if the number of dead livestock is multiplied by the price per head. The lowest cost per cow is IDR 20 million to IDR 50 million. If calculated using the lowest price alone, the total loss is IDR 154.36 billion (7,718 heads x IDR 20 million). Data 7,718 is the official data reported. Usually, the official data is lower than the actual data because some cow deaths are not recorded. That means that the loss is more significant than IDR 154.36 billion.

As explained above, the use of *eco enzymes* in treating NMD has a 100% cure. Thus, *eco enzyme* proved to be effective in the treatment of NMD. In addition to a 100% cure rate, the healing process is relatively fast. On average, the cow only takes 2 to 3 days to recover (Taufik, 2022). From an accounting perspective, this is a significant advantage for farmers. Isn't it that if the farmer's cow dies a loss, then the recovery of the cow is also an advantage? If the use of *eco-enzymes* for treating NMD had been known earlier, the number of cattle deaths could have been reduced.

Maybe someone asks where the environmental accounting perspective is. Eco enzyme is made from household waste in fruit peels and unused vegetable scraps. This household waste is the main ingredient to make the *eco enzyme*. That means that waste that should be disposed of but is used for *eco enzymes* is not disposed of. That means reducing waste disposed of in landfills (DIL). That can be calculated for its economic value and other effects caused by not disposing of garbage. Another economic value generated from cows' recovery from NMD is the use of *eco enzymes*.

Water mixed with *eco enzyme* is then used for bathing livestock infected with NMD, so this water flows onto the ground. This water will help normalize polluted soil (Kumar et al., 2019) (Bharvi S. Patel, Bhanu R. Solanki, and Archana U. Mankad, 2021). Thus, using *eco enzymes* in various ways is a campaign to improve the environment. Environmental accounting can play a role in calculating the economic benefits obtained by utilizing *eco enzymes*.

### **Advantages and Disadvantages of Using Eco Enzyme**

NMD is a disease that is most feared by all countries worldwide. That is because NMD is a highly contagious disease. The various impacts of economic losses caused by NMD include decreased meat production and restrictions on the traffic of livestock and livestock products (Budipitojo, 2022). The use of *eco enzymes* to treat NMD has several advantages, including the fact that this *eco enzyme* is environmentally friendly or, commonly known as *the green economy*.

The use of this *eco enzyme* to treat NMD has begun to be widely used by breeders, especially after the many reports and testimonies about its success. Another advantage of this *eco enzyme* is that it is easy to manufacture. Everyone can make the *eco enzyme*. Raw materials *eco enzyme* is easy to get and cheap. At the start

of the NMD outbreak, breeders were very worried because there was no good solution yet. In June, July, and August 2022, especially in West Java, Central Java, and East Java, an *eco enzyme community* emerged that distributed *eco enzymes* free of charge.

After experiencing the benefits of eco enzymes, the breeders started to make them. *The eco enzyme* can be used in many ways, not only for NMD treatment. *The eco enzyme* can reduce pollution. This was done at the Piyungan TPA, Bantul Yogyakarta, on September 17, 2022. *The eco enzyme* can remove odors from the Piyungan TPA (Winduajie, 2022). *Eco enzymes* can also purify water (Janarthanan, Mani, and Raja 2020).

Water mixed with an eco enzyme can function as an *Air purifier* to clean the air from toxins and pollution. Currently, *eco enzymes* have been developed in various fields: agricultural and plantation *eco enzymes*, fishery *eco enzymes*, beauty *eco enzymes*, health *eco enzymes*, and household *eco enzymes*. The use of this *eco enzyme* in various fields is in line with the UN protocol regarding *Sustainable Development Goals (SDGs)*. In addition, this *eco enzyme* will protect the environment from several types of pollution (Galintin et al., 2021).

Various advantages of *the eco enzyme* have been described above. However, *eco-enzymes* also have drawbacks. This deficiency is based on the results of the researcher's thinking and has been confirmed during the FGD. *Eco enzyme* is the result of fermentation. Therefore, the quality of *eco enzyme* cannot be standardized because it depends on the quality of the materials used in its manufacture. Environmental temperature can also affect the quality of *eco enzymes*. The results of the researcher's interview with an informant, PH. He explained that apart from ingredients, the *eco enzyme* can also be influenced by the mood in which it is made.

The availability of *eco enzymes* is not always there because the fermentation process takes at least three months. Therefore, it must be routinely made *eco enzyme* to maintain its availability. Another drawback of *the eco enzyme* is that it can irritate if they use an excess dose. In addition, plants can die from using *eco enzymes* directly on plants, which are not diluted. That is due to high levels of *eco-enzyme* acid, which can cause plants to burn.

### **Cost of Making *Eco Enzyme***

Every manufacturer of a product certainly has a cost of production. Likewise, *eco enzyme* certainly has a cost of production. The need to know the price of production aims, among other things, so that the product can be compared with various other products, especially similar products with the same function. In accounting, a product's cost is incurred until the product is ready for sale or use.

The main ingredients for *eco enzymes* are brown sugar, fruit peels, and water. The comparison of the three components is 1:3:10. To facilitate the calculation, it is assumed that 1 kilogram of brown sugar, 3 kilograms of fruit skin, and 10 kilograms of water. The price of brown sugar on the market depends on the quality and type, which is between IDR 20,000.00 and IDR 40,000.00/kilogram. The assumption is that brown sugar of the best quality is used, namely the highest price of IDR 40,000.00.

After determining the price of brown sugar, the next step is to collect fruit skins. This fruit peel is free because it is just household waste. Ask someone to look for fruit peels at a salad, pineapple, or orange juice seller. The salary is IDR 10,000.00 for 3 kilograms of fruit skin. Next is 10 kilograms or 10 liters of water. Let us assume a gallon of water is purchased for IDR 5,000.00. Required container for storage during the fermentation process. It is believed that the price of the container is IDR 50,000.00. This container can be used for ten times the

manufacture of the *eco enzyme*. Thus, once used, a tariff of IDR 5,000.00 is charged. It is assumed that labor costs are IDR 10,000.00

The basic price for making *eco enzyme* is the price of brown sugar plus the price of fruit peels, plus the price of water, plus the depreciation of the fermentation vessel, and added direct labor. When added together, the result is IDR 70,000.00 = (IDR 40,000.00 + IDR 10,000.00 + IDR 5,000.00 + IDR 5,000.00 + IDR 10,000.00). To produce 10 liters of the *eco enzyme*, the cost of production is IDR 70,000.00 divided by ten means IDR 7,000.00/liter. This price is low, with a million properties and benefits.

## CONCLUSIONS AND SUGGESTIONS

### Conclusion

This research has several conclusions as follows:

The effectiveness of using *eco enzymes* for NMD is considered very effective. All cows prove this with indications of NMD treated with *eco enzyme* 100% cured. From an environmental accounting perspective, the *eco enzyme* is an environmentally friendly liquid that impacts improving ecosystems and reduces organic waste disposed of in landfills.

The *eco enzyme* can treat NMD in various ways, for example, for beauty, agriculture, fisheries, etc. Meanwhile, the drawback of the *eco enzyme* is that it cannot produce an *eco enzyme* with standard quality. In addition, there is a limited supply of *eco enzyme* because it is made through fermentation.

The introductory price for making a *one-liter eco enzyme* is IDR 7,000.00 (seven thousand rupiahs). This price is meager compared to a million *eco enzyme* benefits and efficacy as a magic liquid.

### Suggestion

After the research ends, the researcher has the following suggestions:

It is necessary to disseminate information about *eco enzymes* so that more people are involved in efforts to improve the environment with *eco enzymes*. Careful steps are needed to calculate the economic value of using *eco enzymes* in various ways. For further research, this research should involve multiple scientific disciplines, such as veterinary medical personnel, environmentalists, and animal husbandry experts.

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## I. APPENDIX

No.	Question	Answer
1.	Do you know of foot and mouth disease?	Informant 1: At first, we didn't know, but we found out after we got the cow.

		<p>Informant 3: I don't know yet, I thought it was an ordinary fever, but I was surprised how there was an excess of it. After that, how come the cow can't stand up?</p> <p>Informant 2: I don't know, sir. We are confused, we have reported it to the service, but there has been no response.</p>
2.	Where did your cow get NMD/infected from?	<p>Informant 1: A neighbor's cow got it, which continues spreading to our cows. He said he bought new cows from the animal market.</p> <p>Informant 2: I don't know where it got infected because it was initially fine. How come it suddenly didn't want to eat and kept coming out?</p> <p>Informant 3: There is a neighbor's cow that got hit, sir. Ultimately, even though the service had treated it, our cow got hit.</p>
3.	How do you treat NMD in your cow?	<p>Informant 3: At first, we were confused until we gave bodies. Then volunteers came, saying they were sprayed with this liquid medicine. This eco enzyme provided free</p> <p>Informant 1: I give empong-empong. It's the same for us, sir. If you're sick, drink herbal medicine. So my cow does too. We are confused about giving treatment. We don't understand medicine</p> <p>Informant 2: I got information from a friend, sir, who said there is a spray drug from the eco enzyme. I finally met someone who said they made their eco enzyme.</p>
4.	How do you use this <i>eco enzyme</i> ?	<p>Informant 1: I spray it in his mouth up to 5 or 7 times daily. I also spray the food/grass.</p> <p>Informant 2: I immediately rubbed the cow's mouth and mixed it into the drink.</p> <p>Informant 3: I smear his mouth with this eco enzyme. I drink it and even spray the cage with the eco enzyme. Not only that, I even bathed myself using the eco enzyme.</p>
5.	In your opinion, does <i>eco enzyme</i> help cure NMD in your cow?	<p>Informant 1: It helps to use it; the proof is that the cow doesn't eat after the second day. The cows are ready to eat.</p> <p>Informant 2: Thank God there is the eco enzyme, so our cows can be healthy again; otherwise, they might have died.</p> <p>Informant 3: I'm very grateful, sir. One of our neighbors had a cow that died because he didn't want to use this eco enzyme, even though he gave it for free. He said he already had medicine from the doctor.</p>
6.	How many of your cows have NMD?	<p>Informant 1: If I have 5 NMDs, two are still healthy. But if you don't have this eco enzyme, maybe those two are also affected. So we spray all of them, sir, so they are healthy. We spray them too</p> <p>Informant 2: Initially, only two were affected, sir. After four days, ten were also infected, so there were 12 tails with NMD. But Alhamdulillah, all healed, sir.</p> <p>Informant 3: The cows haven't been touched yet, and it's just a precaution. So I sprayed the cows, the cages, and even the food. Thank God you're safe, sir. None of them contracted NMD.</p>

8.	Where did you get the eco enzyme from?	Informant 1: Give it away for free, sir and ladies, he said, from a poor eco enzyme volunteer. They come here in groups.
		Informant 2: I'm from pa AH, and he made it himself. Many are scattered here and said to treat and prevent NMD.
		Informant 3: I got it from an eco-enzyme volunteer. We were given free. Thank God, sir, someone came as a savior. We have given up on not doing much with this NMD.



SPRAYING *ECO ENZYME* AT THE MOUTH OF THE COW