

Maggot As an Alternative to Organic Waste Management in Kaliboja Village Pekalongan

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Abstract

*Organic waste is one of the environmental problems that must be handled properly and correctly so as not to cause other problems. This research aims to analyze the problem of organic waste in Kaliboja village paninggahan district pekalongan using maggot. This was done for 45 days in kaliboja village. Qualitative methods are used in this study with data collection techniques in the form of observation, free interviews, and documentation. The collected data is tested using the completion method when collecting the data. The result of this study is that maggot cultivation can help overcome the problem of organic waste in kaliboja village. Organic waste is managed by making it as maggot feed or *Hermetia illucens*.*

Keywords: Maggot, Organic Waste, Kaliboja Village

INTRODUCTION

Organic waste is one type of waste that can be decomposed, because it consists mostly of organic compounds, such as: leftover plants, animals, and dirt. (Nur et al., 2018, p. 45). Organic waste is widely contributed by household members through the rest of the food eaten every day. In Pekalongan district, organic waste becomes a serious problem. In 2019, there were

at least 208 tons of garbage collected every day. (Susanto, 2019). Some of it is organic waste leftovers of household food. This number is predicted to continue to increase, as people's food consumption increases. To reduce the increasing amount of waste, pekalongan regent issued regulations related to the handling of waste. (Pekalongan, 2019).

Organic waste is also a problem in kaliboja village paninggaran district pekalongan district. Based on the author's observations, organic waste is thrown away by residents around the yard. There is also a small percentage of residents who give organic waste to their domesticated animals. Kaliboja villagers have tried to handle garbage somewhere. According to one of the informants, residents had agreed on garbage disposal in the upper area (hillside), but did not last long. The first reason, residents are worried that there will be landslides caused by garbage deposits. The second reason, the location of garbage disposal is quite far from the homes of residents. In addition, residents have also requested the procurement of garbage transport vehicles, such as tosa to the relevant parties, but have not been realized.

Maggot can be used as an alternative solution to the problem of organic waste in kaliboja village, because maggots can decompose the organic waste of the local community. In addition to being a decomposer of organic waste, maggots can also be used as protein-rich animal feed. (Mudeng et al., 2018; Salman et al., 2020). The author observed that there were several residents who raised fish, chickens, and goats. Therefore, maggot cultivation can help residents in supplying protein of their livestock.

Many studies discuss about kaliboja village paninggaran district Pekalongan district. However, most of the research discusses the natural resources in the village, especially tea. The Princess' research is titled "Pengaruh Keberhasilan Program Corporate Social Responsibility terhadap Implementasi Creating Shared Value" Discussed the influence of CSR programs on plasma tea farmers built by PT Pagilaran in Kaliboja village. Quantitative methods are used in this research, so that the high success rate of the program CSR (Putri & Siwi, 2019). Similar research was also conducted by Perwitasari, et al., entitled "Keberlanjutan Kemitraan Petani Plasma Teh dan PT. Pagilaran: Bagaimana dan Apa yang Mempengaruhi?". This study discusses the level of willingness of tea plasma farmers in cooperating with core companies, as well as the factors that influence it. Qualitative methods were used in this study, so it was concluded that most tea plasma farmers were interested in continuing cooperation and also obtained several factors that affect, namely: the age of farmers, tea production, and the effectiveness of partnerships. (Hani Perwitasari, Arif Wahyu Widada, Anung Pranyoto & Sugiyarto, 2021).

This research is important because it helps solve the problem of organic waste in kaliboja village. In addition, the study also opened up new insights about household income through maggot cultivation. Qualitative methods are used in this study, so that in-depth information on waste management in the village is obtained. This was done for 45 days in kaliboja village. There are three techniques used in collecting data: observation, free interviews, and documentation. The data is tested using the completion method (Mahsun, 2012), So it is worth analyzing using descriptive methods.

RESULT AND DISCUSSION

The Reality of Organic Waste Management in Kaliboja Village

Kaliboja is one of the villages in Paninggaran district of Pekalongan district which is directly adjacent to Banjar Negara district. Kaliboja village has four dukuh, namely: East Semboja consists of five RT, West Semboja consists of three RT, Kaligenteng consists of three RT, and Silemud consists of three RT (Kaliboja, 2021). The number of RT in this village shows that kaliboja village has a large population. The large number of residents in Kaliboja village affects the accumulation of waste both organic and non-organic.

Waste, as described in article 1 of Law No. 18 of 2008, is the rest of human daily activities and/or solid natural processes. In the article it is also explained that everyone can be considered as a waste producer (Indonesia, 2008), no exception for the people in kaliboja village. In kaliboja village, garbage becomes a common sight around the house, because residents do not have a temporary landfill. According to the author's observations, around people's homes there is plastic waste, atoms, and food waste or commonly called organic and inorganic waste.

According to Moerdjoko, as quoted by Thoyib Nur, waste can be classified into two types, namely: organic waste and inorganic waste. Organic waste is a type of waste composed of organic compounds, such as: plant waste, animals, and dirt, while inorganic waste is a type of waste composed of inorganic compounds, such as: plastics, metals, and bottles (Nur et al., 2018, p. 45). In kaliboja village, organic waste is usually thrown around the house, while for those who have livestock, organic waste is used as animal feed. Based on the observations of the author, residents who have small numbers of livestock, so organic waste management is still not maximal. Inorganic waste is usually burned by residents after waiting to collect a lot.

The Pekalongan Regency Government tried to overcome the garbage problem by issuing Pekalongan Regent Regulation No. 44 of 2018. The regulation contains about Pekalongan Regency Regional Policies and Strategies in The Management of Household Waste

and Household Waste (Pekalongan, 2018). According to the author, the regulation is less evenly implemented in various regions in Pekalongan district. Because, in kaliboja village there is no planned, integrated, and programmatic waste management, as contained in article 3 of Perbub No. 44 of 2018 (Pekalongan, 2018).

Garbage that is generally thrown into the last landfill (TPST), is left alone around the house by kaliboja villagers. These actions can have a negative impact on the environment. Organic waste, although it can settle in the soil, affects the survival of the organisms that live in it. Inorganic waste has a more dangerous impact, because some of it has harmful toxins, such as: plastic, battery stones, and the rest of the drug (Dahruji et al., 2016, p. 38).

Kaliboja villagers are partly concerned with waste management, but others are less concerned. Residents who are concerned with waste management are depicted in the statement of one of the residents who explained that kaliboja villagers actually want to have a garbage transport vehicle such as tosa, so that garbage can be taken to a temporary landfill. However, this desire has not been realized, so residents let garbage strewn around the house. As for some residents who are less concerned is illustrated by the phenomenon of garbage cans that have been provided in the West Semboja dukuh. The author observed that there were garbage cans provided at the four points of the West Semboja dukuh. The barrels are used to dispose of organic and non-organic waste. Although it has been provided garbage cans, but residents do not use it as a trash can.

Based on the information obtained, kaliboja villagers once agreed to dispose of garbage in the upper area near the hills. This temporary landfill once ran for some time and finally came to a halt. There are two reasons the author got about stopping residents from dumping garbage in the upper areas. First, residents are worried about erosion or landslides that endanger the residents below. Second, the distance between the residents' homes and temporary disposal sites is quite far, so residents are reluctant to throw garbage to the location.

Maggot's Potential in Breaking Down Organic Waste

Maggot larvae or also called Black Soldier Fly (BSF) is one of the species of flies originating from the Americas. Maggot has spread throughout the world, not least Indonesia. In Indonesia, maggots have natural ecosystems located in Maluku and Irian Jaya (Putra & Ariesmayana, 2020, p. 12), While in other places in Indonesia, such as Pekalongan regency, maggot ecosystems are generally artificial ecosystems, because maggots do not live naturally, but are cultivated by breeders around their homes.

Maggot, which has the Latin name *Hermetia illucens* has many benefits, including: as animal feed and organic waste decomposer. According to Harlystiarini, as quoted by Reni Mulyani, maggots have a flour fat content of 27.36% (Mulyani et al., 2021, p. 571). In addition, maggots also have a protein content of 40-50% (Putra & Ariesmayana, 2020, p. 12). Therefore, maggots are very suitable for use as animal feed. In addition to assisting farmers in reducing the cost of livestock, maggots can also accelerate growth and maximize the quality of livestock. Maggots in question are larvae before BSF pupa (Putra & Ariesmayana, 2020, p. 17).

Besides being useful as high-quality animal feed, maggots can also be used as an organic waste decomposer. In its life maggots have four phases of life, namely: eggs, larvae, pupae, and adult maggots. This life cycle lasts for less than 40 days. Of the four cycles, the larval phase plays a role in breaking down organic waste for 12-13 days. Maggot eggs that have hatched begin to eat organic waste. This decomposition rate reaches 55% based on the weight of clean waste (Nofiyanti et al., 2021, p. 2572).

The role of maggots in breaking down organic waste is also known as bioconversion. According to Newton, bioconversion, as quoted by Yongki, is a process of converting organic waste into methane energy carried out by living things through fermentation. Living things that often play a role in the process are: bacteria, fungi, and insect larvae (Putra & Ariesmayana, 2020, p. 12). Therefore, black soldier fly (maggot), as one of the larvae of insects, can also act as a decomposer of organic waste. The bioconversion process of *Hermetia illucens* produces several superior products. In addition to being used as animal feed, as explained, *Hermetia illucens* can also be used as a liquid fertilizer produced from larval fluid and compost produced from the rest of dry organic waste (remaining maggot feed) (Nofiyanti et al., 2021, p. 2572).

Organic waste is used maggots as a food source. Maggot's ability as an organic waste decomposer can not be separated from the content of bacteria contained in the digestive tract. Cellulotic bacteria in the maggot intestine produce the cellulase enzyme that acts as hydrolysis. Maggot mouths shaped like hooks become the main force in chewing food, both from food scraps, animal carcasses, and vegetable waste (Nofiyanti et al., 2021, p. 2573). By another sentence, maggots have the potential to break down organic waste.

Maggot as an Alternative to Organic Waste Management in Kaliboja Village

Organic waste in Kaliboja village has not been properly managed by residents. Not a few people who throw garbage around the house. This problem needs to be addressed as early as possible so that garbage does not accumulate and pollute the environment. Maggot is used as an alternative to waste management in kaliboja village. Maggots were chosen because they have

three reasons, namely: maggots can decompose organic waste, during the larva can be used as quality animal feed, and maggot feces can be used as compost.

In solving the problem of waste management using this maggot, the author divides it into three stages, namely: planning, implementation, and evaluation. First, planning. In the planning stage, the author looks for information about someone cultivating maggots to learn more about the maggot cultivation process and get maggots to cultivate. The author was directed by one of the informants to Nasimin. Nasimin is one of the maggot cultivators who live in Kesesi. After discussing with Nasimin, the author tried to cultivate maggots from eggs. The selection of eggs as the first step of maggot cultivation because eggs are the beginning of maggot life, so the author can understand the life cycle of maggots from the beginning.

Second, implementation. Maggot eggs are obtained from Nasimin as much as 3 grams. This 3 gram amount was chosen because it can be said to be a moderate amount (not a little and not too much). Eggs that amount to 3 grams can later become maggots amounting to 3 kilos. As a beginner cultivator, 3 kilos is the amount that matches the knowledge and experience of writers who are still beginners. At first, 3 kilos of eggs were cultivated using a bucket medium that was given a mixture of bran and tofu pulp. On it, the author gives a base in the form of tissu or banana leaves, so that the eggs do not directly touch the bran and tofu pulp. Raharjo, in his research explained that black soldier fly females lay eggs on dried banana leaves for approximately three days. The eggs hatch for approximately three days in turn (Raharjo et al., 2016, p. 35). This is also experienced by the author when observing maggot eggs that begin to hatch for 2-4 days on a rotating basis.



Figure. 1. Maggot cultivation in Ember given Tissu and dried banana leaves

After all the eggs hatched, the author replaced the bucket medium with a wooden cage or pring, because the eggs that were 3 grams turned into 3 kg of larvae. All small larvae present in the bucket are transferred to the pring cage, left for 7-10 days while being given soft food, such as: the rest of the banana. Gentle feeding is useful to facilitate small larvae to eat food.

According to Fahmi, larvae that are 6-9 days old still have a length of 5-10 mm and a width of 1-2.5 mm (Rini Fahmi et al., 2009, p. 226). Larvae begin to be given a variety of organic waste food at the age of 14 days. Feeding maggots of this age also do not need to be chopped to be soft, because the size has begun to enlarge to longer than 10-15 mm and a width of 2-3 mm. (Rini Fahmi et al., 2009, p. 226). Feeding organic waste maggots also does not need to match the overall weight of the maggot. For example, in one cage inhabited by 3 kg of maggots, it does not mean that the food given as much as 3 kg, but adjusted to the needs of maggots.



Figure. 2. Cultivation of Maggots in Wooden Cages

In the process of cultivating this maggot, the author promoted to the villagers of Kaliboja about the benefits of maggots in breaking down organic waste. The form of promotion given by the author in the form of procurement of workshops located in Kaliboja village hall. Residents who attended the workshop seemed enthusiastic through the questions asked. Residents are increasingly enthusiastic when maggot cultivation is not only an alternative to the organic waste management of Kaliboja village, but also can be used as a commodity that can be traded. The author took the initiative to give eggs to residents who had participated in workshops so that they could be cultivated in their homes.

A few days after the workshop, the author monitored the development of residents who had been given maggot eggs. In observation, not a few residents who lack the maximum to keep eggs, so many die. The lack of seriousness of the residents in maintaining maggots is a concern of the author on the sustainability of maggot cultivation in kaliboja village. However, as long as the author cultivates maggots, some of the residents' organic waste can be managed properly. It is said in part, because the large number of maggots that are bred is not proportional to the amount of garbage residents.

Third, the evaluation stage. The author found there are shortcomings contained in the implementation of maggot cultivation and organic waste management process. The disadvantage when cultivating maggots lies in feeding organic waste in the form of salak and kedondong to small larvae. For small larvae, salak and kedondong are organic waste that is

difficult to harvest, so it takes a long time to consume it. The disadvantage in the waste management process is the lack of the number of maggots maintained, so it is not comparable to organic waste that needs to be managed. In this case, the village government needs to appreciate and follow up further so that the problem of organic waste in Kaliboja village can be resolved properly.

CONCLUSION

Based on the above explanation, it can be concluded that maggot cultivation can help overcome the problem of organic waste in Kaliboja village of Paninggaran district of Pekalongan district. Although, the management of organic waste is not so significant because the amount of maggots maintained is not proportional to the amount of organic waste produced by kaliboja villagers. Maggot plays an important role in managing the organic waste of kaliboja villagers. In addition, maggots also play a role in improving the quality of animal feed of the surrounding residents, because it has a lot of fat and protein content.

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