

# Maggot Cultivation Assistance in Loireng Village, Demak With Practitioners from the Panata Bumi Waste Bank

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## Abstract

Loireng Village, Sayung District, Demak Regency, is one of the villages classified as very old. Currently, Loireng Village has become one of the industrial villages in Demak Regency, as many factories have been established in this village area. The location of Loireng Village, which is divided by the Semarang – Demak Highway, even the midpoint of the Semarang – Demak Highway (Km 13) is in the Loireng Village area, is indeed very ideal for becoming an industrial area. That situation is one of the reasons why waste management needs to be prioritized, because the amount of waste generated is not proportional to what is being managed. Currently, the village of Loireng Tengah is struggling to create a clean environment in addressing the waste problem. A good waste management system that adheres to existing standards will also have good development potential and can advance the environment where the waste management is established. So far, the old waste management pattern still follows the paradigm of collecting, transporting, and dumping at the landfill, which causes the landfill to become full. Unmanaged organic waste can endanger the environment and community life. Therefore, these wastes must be controlled in terms of their handling. One form of control that can be applied is the use of Integrated Waste Management Sites (TPST). An integrated waste management site is an area where the collection, sorting, reuse, recycling, and final processing of waste are carried out. For community coverage, TPST is unified into TPS reduce-reuse-recycle (3R). According to information on the technical implementation of TPS3R, the program aims to support activities in reducing and improving waste conditions, which will subsequently be followed by continuous work at the Final Disposal Site (TPA) that contributes to reducing the land requirement for waste disposal sites in urban areas. Through maggot farming, the utilization of organic waste will be more easily controlled. The control referred to is through maggot cultivation, specifically organic waste.

**Keywords:** Waste Reduction, Waste Processing, Environmental Cleanliness, Waste Management System, Waste Recycling

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## 1. Introduction

Loireng Village, Sayung District, Demak Regency, is one of the villages classified as very old. Currently, Loireng Village has become one of the industrial villages in Demak Regency, as many factories have been established in this village area. The location of Loireng Village, which is divided by the Semarang – Demak Highway, even the midpoint of the Semarang – Demak Highway (Km 13) is in the Loireng Village area, is indeed very ideal for becoming an industrial area. Including the center for Micro, Small, and Medium

Enterprises (UMKM) that are abundant in Loireng Village, such as the Salted Egg UMKM, Tempe, Catering, and Dumbuk El-Ahmad Percussion, whose products have been exported to various countries. (Malaysia, Australia, Jepang, Mesir, Israel, Turki, Jerman, USA, Rusia). Meanwhile, the once very fertile agricultural land in this village has now been converted into shrimp farming areas due to the inundation of tidal floodwaters that have entered the Loireng Village area since 2013. The shrimp ponds are alternately stocked with tilapia, milkfish, and shrimp. The location of Loireng Village, which is divided by the Semarang – Demak Highway, and even the midpoint of the Semarang – Demak Highway (Km 13) is in the Loireng Village area, is indeed very ideal for becoming an industrial area. That situation is one of the reasons why waste management needs to be prioritized.

The waste problem is an important issue that can disrupt the balance of the environmental ecosystem. Based on Bappenas calculations in the Indonesian infrastructure book in 1995, the estimated waste generation in Indonesia was 22.5 million tons and will more than double by 2020 to 53.7 million tons. (Mungkasa, 2004). Based on that data, the landfill area requirement in 1995 was 675 hectares and increased to 1,610 hectares in 2020. This condition will become a major problem with the limited vacant land in big cities. According to BPS data in 2001, the amount of waste collected only reached 18.3%, 10.46% was landfilled, 3.51% was composted, 43.76% was burned, and the rest, 24.24%, was disposed of in riverbanks or vacant land.

Efforts to reduce and sort waste at the source will greatly help alleviate the waste problem, especially in urban areas. Not only can this effort reduce the amount of waste entering the landfill, but it can also create a healthier and cleaner environment, which in turn will increase community productivity and improve the quality of life, one of which is through the implementation of the 3R concept. However, it cannot be denied that the implementation of the 3R concept in efforts to reduce waste dumped at the landfill has not been carried out sincerely/maximally by the community in Loireng village because it is indeed not an easy task to do and the difficulty of changing the community's perspective/paradigm that 'Waste as a Resource'. All of this greatly depends on the willingness of the community to change their behavior and perspective that those who produce waste should be responsible for sorting and processing their waste, so that in the future, as little residual waste as possible will be managed at the landfill. Rural areas are generally characterized by low population numbers and density, as well as limitations in both infrastructure and facilities. The geographical conditions in rural areas are very

diverse, including mountains, valleys, hills, ravines, and so on. Therefore, waste management in rural areas should be adjusted to the conditions and characteristics of each region.

Neglected organic waste can endanger the environment and community life. Therefore, these wastes must be controlled in terms of their handling. One form of control that can be applied is the use of Integrated Waste Management Sites (TPST). An integrated waste management site is an area where the collection, sorting, reuse, recycling, and final processing of waste are carried out. For community coverage, TPST is unified into TPS reduce-reuse-recycle (3R). According to information on the technical implementation of TPS3R, the program aims to support activities in reducing and improving waste conditions, which will subsequently be followed by continuous work at the Final Disposal Site (TPA) that contributes to reducing the land requirement for waste disposal sites in urban areas. Through maggot farming, the utilization of organic waste will be more easily controlled. The intended control is through maggot cultivation, where organic waste, specifically household organic waste, can be utilized as maggot feed. (Dewi, R. & Sylvia, N. 2021).

The activity of maggot cultivation is relatively easy because it does not require special stages, so everyone can do it. The cultivation period of these maggots begins with the pupae from BSF flies and ends with the harvest of fresh maggots, which lasts about 15 days. Maggot cultivation can be done on a small or medium scale. The costs incurred are also quite low, and the maintenance does not take up much time because it does not need to be monitored every day. Besides that, the budget for the feed is also not charged because it comes from household organic waste.

Maggots, which are the result of hatching BSF flies, will be utilized and sold in the form of fresh maggots, dried maggots, eggs from these flies, and their by-products such as maggot flour, maggot pellets, prebiotics, and organic fertilizer. Maggots contain several nutrients that are important for livestock, namely high protein content of around 30-45%. Therefore, they are very suitable for use as animal feed, such as for fish, birds, and other livestock/poultry. Organic fertilizer, which is one of the byproducts of maggots, serves to accelerate the recovery of soil quality.

The issue of organic waste management in Loireng Village, Sayung District, Demak Regency, is still not optimal. Therefore, this activity aims to address the issue through the cultivation of maggots as a solution for organic waste management. This activity is aimed

at the people of Loireng Village as an effort to raise awareness and improve sustainable waste management skills.

In an effort to address the waste problem and raise public awareness, we offer two strategic solutions. First, changing the participants' paradigm in the workshop about waste and organic waste processing into economic value through maggot cultivation. Second, enhancing knowledge and understanding of the stages of maggot cultivation.

The expected output targets from this activity are: online mass media publications to raise public awareness and community service reports as a form of accountability and documentation of the activities.

Waste is one of the real environmental problems. Based on data from the Ministry of Environment and Forestry, Indonesia's waste production in 2016 amounted to 65 million tons. This figure increased by 1 million tons from the previous year (<https://nasional.sindonews.com/read/1302781/15/10-problembesar-lingkungan-di-indonesia1525347778>). This is not unrelated to the large number of Indonesian residents who produce waste every day, whether from domestic or non-domestic activities. A city with a large population will also produce a larger amount of waste. It is estimated that each person produces 0.52 kg of waste per person per day. (Jambeck et al., 2015).

Waste is defined as material that has no value or is worthless for ordinary or primary purposes in the production or use of damaged or defective goods in manufacturing, or excess or rejected materials or refuse. (Kamus Istilah Lingkungan, 1994). The issue of waste is a classic problem, yet it remains a constantly relevant issue. It is said so because the waste problem is always highlighted as an ongoing issue and solutions are constantly being sought over time.

Waste can be classified as follows. First, household waste that originates from daily activities within the household, excluding feces and specific waste. Second, waste similar to household waste that originates from commercial areas, industrial areas, special areas, social facilities, public facilities, and other facilities. Third, specific waste that contains hazardous and toxic materials (B3), B3 waste, disaster waste, demolition debris, waste that cannot yet be processed technologically, and non-periodic waste.

Based on its nature, waste is divided into two types. First, organic waste that is easily degradable and decomposable, such as vegetable waste, leaves, animal parts, food scraps, paper, wood, and so on. Second, inorganic waste that is difficult to degrade and

decompose in a short period, such as plastic, glass, metal, cans, and so on. Waste that originates from living organisms is commonly known as organic compounds. Chemically, organic waste is more easily degraded compared to inorganic waste, so if it is buried in an open environment for a long time, it will produce an unpleasant odor. Organic waste always takes center stage in waste management issues. This is because its smell disturbs the environment and health, is a source of various diseases, causes leachate pollution that seeps into groundwater and rivers, can cause landslides and floods, is unsightly, and can decrease property value. (Sejati, 2009).

Maggots or larvae of the black soldier fly (*Hermetia illucens*) are decomposer organisms due to their habit of consuming organic materials. Maggots are an alternative feed that meets the requirements as a source of protein. (Fauzi & Sari, 2018). According to (Amelia, 2014) and (Raharjo et al., 2016), maggots contain 39.95% protein, and black soldier fly maggots also contain antimicrobial and antifungal properties, thus not carrying diseases to fish (Bibin, M. et al.). 2021).

Maggots are the larvae of the Black Soldier Fly (BSF) species, so they are often referred to as Black Soldier Fly (BSF) maggots. The BSF fly itself has the Latin name *Hermetia illucens*. Its shape resembles a caterpillar, hairy with an adult larva size of 15-22 mm and brown in color. The life cycle of the BSF fly is almost the same as 4043 days. BSF larvae/maggots survive for 14-18 days before metamorphosing into pupae and adult flies. Very different from the usual types of flies, such as houseflies and green flies known as disease carriers, this fly will not emit an unpleasant odor and is not a disease carrier because its body contains natural antibiotics. Flies generally land on dirty places, but unlike BSF flies, this flies only nests in places with fermented materials. (Rianti,2022).

Maggots, which are the result of hatching BSF flies, will be utilized and sold in the form of fresh maggots, dried maggots, eggs from these flies, and their by-products such as maggot flour, maggot pellets, prebiotics, and organic fertilizer. Maggots contain several nutrients that are important for livestock, namely high protein content of around 30-45%. Therefore, they are very suitable for use as animal feed, such as for fish, birds, and other livestock/poultry. Organic fertilizer, which is one of the by-products of maggot, has the function of accelerating soil quality recovery.

The activity of maggot cultivation is relatively easy because it does not require special stages, so anyone can do it. The cultivation period of these maggots starts with the pupae from BSF flies and ends with the harvest of fresh maggots, which lasts about 15 days.

Maggot farming can be done on a small or medium scale. The costs incurred are also quite low, and the maintenance does not take up much time because it does not need to be monitored every day. In addition, the budget for its feed is also not charged because it comes from household organic waste.

The working procedure for BSF fly cultivation includes several stages. First, prepare the tools and materials. Then, make a fly cage and a maggot container. Next, chop the organic waste and place it into the maggot container. The container was then covered with cloth and placed in a damp spot. The process continues with daily monitoring to ensure the reduction of waste. After that, the remaining waste is sorted using maggots. Finally, the large maggots are separated and transferred to a bucket containing bran for animal feed. (Salman, dkk., 2020).

From our initial observations, we have developed a simple method of maggot cultivation that can be easily practiced by the community. The stages in the process of maggot cultivation to feed BSF flies so that they can be bred as part of the maggot farming activities.

A. Ingredients needed

- 5 kg of bran or rice bran
- 1 bottle of EM4 or it can be replaced with 1 bottle of Yakult
- 5 tablespoons of granulated sugar
- 1 liter of water
- Flavor enhancer

B. Production equipment

- Bucket (1 large and 1 small) or can be replaced with a tray
- String for tying
- Clear plastic bags
- Leaves or food scraps

C. Production stages

- 1) First, prepare a small bucket and fill it with 1 liter of water. Add granulated sugar and EM4 or Yakult, then stir until well mixed.
- 2) Prepare a large bucket and fill it with bran or rice bran, and add flavoring to make the aroma more pungent to attract BSF flies. Stir until well mixed.
- 3) Gradually mix the solution from the small bucket into the large bucket while stirring until well mixed. The mixture of the two is neither too dry nor too wet.

- 4) Put the mixture into a clear plastic bag halfway and tie the end because the bran will ferment and produce gas, so there needs to be air space for the fermentation gas. Tie the end of the clear plastic bag with raffia and store it in a cool place, waiting for 4-5 days.
- 5) After 4-5 days, the plastic bag can be opened. Fermentation will be successful if a fermentation aroma appears, which is an aroma similar to tape.
- 6) Fermentation of bran or rice bran can be placed in an area protected from pests and, if possible, covered with leaves or sprinkled with food scraps. The maximum temperature in the maggot storage container is between 30-38 degrees Celsius. It would be better if the storage container receives enough sunlight to keep it warm, as this can help with the egg hatching process, and the air circulation must also be good.
- 7) The aroma from the fermentation process will attract the flies to land and lay eggs around the fermented bran.

Loireng Village is a village in the Sayung District, Demak Regency, Central Java Province, Indonesia, divided by the Semarang-Demak Highway precisely at KM 13. The population of Loireng Village is 3,502 people with 1,015 families and an area of 315 hectares. The residents of Loireng Village, besides being farmers, are mostly factory workers. Geographically, Loireng Village is located in Sayung District, Demak Regency, Central Java Province, Indonesia.

The boundaries of the Loireng Village area are as follows:

- The northern side borders Gemulak Village
- The southern side borders Tambakroto Village
- The eastern side borders Batu Village
- The western side borders Sayung Village

## **2. Method**

### **Method of Implementation of Service**

In organizing a waste management system in rural areas, there are stages that must be passed to facilitate local governments in determining the appropriate waste management methods for each area's conditions. The stages that must be passed are as follows: (Figure 3.1)



Figure 3.1. Stages of Implementing Waste Management Systems in Rural Areas.

The explanation of the following image is as follows:

1. Conducting surveys and investigations in the area where the waste management system will be implemented. The stages of the survey that will be conducted are the survey of existing conditions and the survey of population size and density.
2. Then the local government determines the method to be used for managing waste in rural areas, based on the socio-cultural aspects of the community, geographical conditions, and the local government's capacity for operation and maintenance.
3. After the method is determined, then provide socialization to the surrounding community to give information and understanding regarding the waste management plan in the area.
4. The implementation of the waste management system is carried out by building and/or providing appropriate infrastructure and facilities.
5. After the infrastructure and facilities for waste management in rural areas have been established, the local government can provide assistance and monitoring to ensure that the waste management system operates properly and correctly, and that the waste processing units function effectively so that waste in rural areas is well managed.

Waste banks can be a first step in tackling the waste problem. Apart from reducing the potential disaster in the form of floods, the waste bank can also create job opportunities and improve the living standards of the residents of Loreng village in the economic sector. In its implementation, the work program begins with planning activities to educate the community about waste. Next is the creation of the waste bank organizational structure and the opening of land for the waste bank, followed by building a network with the



Environmental Agency. Secondly, an evaluation of the ongoing program is conducted by holding a meeting with the heads of neighborhood associations in Loireng Village and the Environmental Agency.

Schedule for Maggot Cultivation Assistance, Panata Bumi Brebes Coordinator, Sunday,  
December 4, 2022

<b>Time</b>	<b>Agenda</b>	<b>Event Host</b>
09.00-09.30	Introduction to the Panata Bumi Waste Bank	panata bumi Team
09.30-12.00	Stages of Maggot Production	Pendamping Team
12.00-13.00	Ishoma	
13.00-13.30	Handing over Maggot and Trash Bins to Village Representatives	panata bumi Team
14.45-15.00	Closing	BS Loireng Team

### 3. Results and Discussion

#### **Educating the Community about Waste Banks and Waste Sorting Methods**

In this activity, we sincerely hope that the BSF fly cultivation program will be a new initiative that can create business opportunities and serve as an effort to reduce excessive waste in the community, especially organic waste. (Alizahatie,2019). The "home-based" business referred to here is a venture that is currently popular among the community, starting from the young, teenagers, and adults. (Lismayeni, dkk .2020). Therefore, the cultivation of BSF flies is also very easy to do and has a positive effect on the community, as it can be used as livestock feed and provides high-quality results for poultry. On this occasion, the Village Government is also very enthusiastic about welcoming the organic waste processing program, so the village government also hopes for cooperation with the community and other parties to jointly contribute to raising awareness about organic waste processing and increasing business opportunities for the community in the field of cultivation.

### **3. Conclusion**

Based on the training activities that have been achieved, the following conclusions can be drawn: (a) The participants' paradigms have improved, (b) The workshop participants are satisfied with the implementation of maggot cultivation, and (c) The workshop participants have skills in maggot cultivation.

#### **Suggestion**

Some suggestions we can propose based on the training results are as follows: (a) This training can be continued with advanced stages or materials on the utilization of organic waste, and (b) Further research to determine the components contained in maggots.

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