

Maggot BSF Cultivation Development Strategy As Economic Resilience During Pandemic

Anita Mauliya Hanim¹⁾, Wulan Purnamasari²⁾, M Adhi Prasnowo³⁾, E Risky Wulandari⁴⁾,
Muhajir Sulthonul Aziz⁵⁾ and Meithiana Indrasari⁶⁾

1) *Departmen of Management, Universitas Maarif Hasyim Latif, Sidoarjo, Indonesia*

2) *Departmen of Management, Universitas Maarif Hasyim Latif, Sidoarjo, Indonesia*

3) *Departmen of Management, Doctorate Program, Universitas Dr. Soetomo, Surabaya, Indonesia*

4) *Department of Islamic Broadcast Communication, Institute Agama Islam Hamzanwadi NW, NTB, Indonesia*

5) *Department of Islamic Broadcast Communication, Institut Agama Islam Darullughah Wadda'wah, Pasuruan, Indonesia*

6) *Departmen of Management, Universitas Dr. Soetomo, Surabaya, Indonesia*

²⁾*Universitas Maarif Hasyim Latif, Sidoarjo, Indonesia*

E-mail: wulan_purnamasari@dosen.umaha.ac.id

Abstract. This research is motivated by the large amount of waste that accumulates in many areas in Indonesia, especially household organic waste. The accumulated amount of waste is caused by the processing that is still not optimal to reduce the capacity of the amount of waste. Mr. Bilal's maggot cultivation business is a proven effective way to reduce the capacity of household organic waste in his village. The purpose of this study was to study the profile of maggot cultivation in KarangPilang District, to analyze the prospects for the development of maggot cultivation during the covid pandemic, to determine a cultivation development strategy that is in accordance with the conditions and potential in the city of Surabaya.

The population used in this study were all maggot cultivators in the city of Surabaya. The sample in this study was Maggot BSF cultivator Mr. Bilal in Kedurus village, KarangPilang sub-district, Surabaya. The sampling method is the Accidental Sampling technique. The method used in this research is descriptive qualitative method. Data analysis using descriptive-qualitative analysis, without using quantitative techniques.

The price of maggot is set according to the expenses that have been incurred during the production process and add a percentage to the profit to get a profit. Marketing strategy, introduce more to consumers in order to increase income or more profit, provide the best service, implement a selling system by upholding honesty when explaining maggot with honest conditions, with this attitude consumers will be happy and like this place of cultivation.

Keywords: development strategy, maggot cultivation, organic waste

I. INTRODUCTION

Garbage is a very serious environmental problem faced by the people of Indonesia and the world. Garbage is a familiar name in society, where every region throughout Indonesia has a waste bank that has not been processed as much as possible to reduce the capacity of the amount of waste. Especially household organic waste, markets, and the like. Moreover, garbage dumped in rivers can clog waterways, and make rivers unclean. Organic waste or waste that easily decomposes often causes unpleasant odors and causes disease. In response to these conditions, it is necessary to make efforts to utilize organic waste which also has high economic value. One of the efforts offered is to use Black Soldier Flies (BSF) or *Hermetia illucens*.

Maggot cultivation is used as a source of animal feed, now it is not foreign. The maggot or larvae of the black soldier fly (*Hermetia illucens*) is an alternative animal feed that meets the requirements as a source of high protein. Murtidjo (2001) states that foodstuffs containing crude protein of more than 19% are classified as protein sources. The black soldier fly, Black Soldier fly (*Hermetia illucens*) is almost all over the world. Like other flies, army flies eat anything that has been consumed by humans, such as leftovers, garbage, fermented food, vegetables, fruits, meat and even bones (soft), even eating animal carcasses. These

fly larvae (maggots) are classified as "immune" and can live in quite extreme environments, such as in media/garbage that contains a lot of salt, alcohol, acids and ammonia. They live "in a warm atmosphere", and if the ambient air is very cold or lacks food, then the maggots do not die but they become numb or idle or inactive waiting until the weather warms up again or food is available again. They can also live in water or in the presence of alcohol. BSF insects have several characters including: having the ability to reduce organic waste, having the ability to live within a fairly high pH tolerance, not acting as a disease gene, having a fairly high protein content (40-50%), having a long life as larvae (± 4 weeks), and easy to cultivate.

The development of maggot cultivation in KarangPilang District has not been so advanced. For this reason, there needs to be a research study on the Technical Development of Maggot Cultivation in KarangPilang District, Surabaya City, East Java Province through determining cultivation development strategies that are in accordance with the potential and conditions of the development area. The development of maggot cultivation will be carried out optimally if the potential for maggot cultivation in an area can be well known. Furthermore, the potential for cultivation that already exists in an area needs to be developed in accordance with the carrying capacity of the environment. This study aims to analyze the prospects for the development of maggot cultivation in KarangPilang sub-district and determine the

strategy for developing maggot cultivation in KarangPilang District.

II. RESEARCH METHODS

The method used in this study is a descriptive qualitative method, namely the data collected in the form of words, pictures, not numbers. Qualitative research is a research procedure that produces descriptive data in the form of written or spoken words from people and observed behavior.

Meanwhile, descriptive research is a form of research aimed at describing or describing existing phenomena, both natural phenomena and human engineering. The purpose of descriptive research is to make a systematic, factual, and accurate description of the facts and characteristics of a particular population or area. This study was used to find out how the strategy for developing MSMEs for maggot BSF cultivation during the covid-19 pandemic.

III. RESULTS AND DISCUSSION

1. Development Strategy for the Quality of Mr. Bilal's Maggot Cultivation

a. Cultivation Media Care

The condition of the cultivation media was checked once every day for 14 days. The conditions of the cultivation media were observed from humidity to water content. If needed, the addition of water and maggot feed sources can be done. In addition, the condition of the mosquito net that surrounds the media also needs to be checked and ensured that there are no holes that can cause black soldier flies to leave the cultivation area.

b. Harvest

The harvesting process for maggot cultivation is carried out at least after two weeks of maggot cultivation. At 2 weeks the black soldier fly eggs had hatched and entered the second instar larval stage which grew about 10 mm before releasing the skin into third instar larvae. Third instar larvae grow between 15 mm and 20 mm before entering the prepupa stage. Cultivation carried out with 100 kg of culture media raw materials, can produce larvae as much as 60 -70kg. Keep in mind the maggot life cycle before becoming a fly is 37 days.

The harvesting process is carried out by separating the maggot from the growth medium. After being separated from the growth medium, the maggot is ready to be given to animal feed. Some of the cultivated maggots are left to turn into adult flies. Adult flies will be used as broodstock in the next cultivation. This is so that the cultivation of this maggot can be sustainable and does not depend on the black soldier fly brood from outside.

The maggot harvest period is at the age of 15 - 21 days when the maggots are quite large and still soft, after 21 days the maggots have started the prepupa phase and the pupae are slightly brown in color and if given to livestock the texture is rather hard. For the protein content, the maggots are still white than those that have entered the prepupa or pupa phase.

Maggot eggs to become prepupa 26 days, from prepupa phase to pupa phase 7 days. From pupa to fly also takes 7 days. So in one maggot cycle from egg to fly again it takes approximately 1.5 months. When male flies have mate, they will die or become carrion,

female flies after laying eggs will also die or become carrion. To get BSF flies, Mr. Bilal provides bait by mixing pineapple juice without sugar without milk with rice and dedek because BSF flies like sour and fermented smells. That way the BSF flies will come and enter the BSF parent cage that has been baited.

c. Mr. Bilal's maggot cultivation quality development strategy

1. Provide adequate and regularly available feed in order to grow and enter the next phase.
2. Maggot is placed in a shady environment away from sunlight.
3. Provide fresh organic waste feed with high protein intake so as to get good maggot yields that make consumers satisfied with the quality of maggot.

2. Pricing Strategy for Mr. Bilal's Maggot Cultivation

In the maggot cultivation process, equipment and raw materials are required. Equipment costs are costs incurred for the cultivation process, the cost of raw materials is needed to prepare media for laying black soldier flies (*Hermetia illucens*) and where maggots develop. The price of maggot is determined according to the expenses that have been incurred during the production process and add a percentage to the profit to get a profit.

TABLE I
Maggot Price Table

Species	Price (IDR)
Maggot eggs	15.000/gms
Maggot	25.000/kilos
Prepupa & Pupa	250.000/ilos

3. Marketing Strategy for Mr. Bilal's Maggot Cultivation

During the covid pandemic, as it is currently affecting the marketing of maggot, income has decreased. So he thought of a strategy on how to keep his business running.

a. Join many farmer groups.

In offering his maggot products, he offersmaggot to farmer groups. Because he understands that by having regular customers or partners, a business can definitely grow. Currently he is joining 4 farmer groups.

b. Offering maggot to anglers.

Mr. Bilal offered his maggot to anglers by bringing samples of maggot. He marketed maggot by visiting friends who have a hobby of fishing. Because according to Mr. Bilal, the anglers do not know the pandemic. So his target is not only the farmer groups, but also the fishing hobbyists.

c. Marketing maggot through online media.

Not only word to word, Mr. Bilal also has a website and Instagram to promote his products, who is responsible for marketing maggot through online media, namely his own wife. So they divided the tasks for the wife's online kitchen and the offline kitchen including the cage section for Bilal's Mr., Bilal's Mr.'s section, Bilal's Mr.'s section, the wife's online kitchen and the offline kitchen including the cage section for Bilal's online media, namely his own wife. So they divided the tasks for the online kitchen for the wife's section and the offline kitchen including the cage section for Mr. Bilal's.



Fig. 1. Mr. Bilal's Maggot Cultivation Area

The space provided must be flexible because this cultivation business can use vacant or unused land as a place of cultivation. This is due to the lack of criteria in selecting a place to cultivate BSF, namely the presence of a place exposed to direct sunlight. This criterion only applies to adult flies, while larvae and pupae are not required at all.



Fig. 2. BSF Fly Cage

The cage is a need for every farm animal, the function of the cage is as a place for the Black Soldier Fly to produce eggs as BSF maggot seeds. The cage is also a place for feeding maggot in the form of organic waste. the size of the cage is 150 x 150 cm. With the size above, it can accommodate as many as tens of thousands of larvae.



Fig. 3 Egg Hatching Media

The media for hatching BSF eggs is made of plywood or wood. Wood measuring 40 x 7 x 1 cm that has been stacked into four, five, or six is given a matchstick in between and tied with rubber at the end so that it leaves a small gap. This small gap will be used by BSF to lay its eggs. Separate the hatching and rearing media in the cage. This division is very meaningful because if they unite, the eggs will be easily damaged by the larvae.

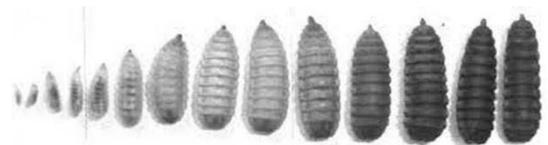


Fig. 4 Changes in Larvae Size

The larval phase which is still yellowish white lasts approximately 12 days. Next, the larvae begin to turn brown and darker. The prepupa phase occurs from the 19th day and the pupa phase is reached on the 24th day. Changes in body size of larvae from instar 1 to pupa can be seen in Figure 1 instar larvae that have just hatched generally measuring 2 mm, then measuring 5 mm before the skin shedding process started. The second instar larvae grow to 10 mm before being ready to shed their skin to develop into third instar larvae. Prior to the prepupa stage, the third instar larvae grow to 15 mm to 20 mm.

In maggot cultivation, the media that is a place to grow must contain sufficient nutrients. Nutrient is one of the most influential factors on the biochemical composition of natural feed. The nutrients contained in the cultivation media greatly affect the productivity value of the quality of the maggot produced. In this study, the nutrients provided were found in the cultivation media consisting of tofu pulp and coconut pulp mixed together.



Fig. 5 Feeding Process

Provide fresh organic waste feed with high protein intake so as to get good maggot yields that make consumers satisfied with the quality of maggot

IV. CONCLUSIONS

1. Product quality development strategy

Maggots are placed in a shady environment away from sunlight and fed with fresh organic waste in sufficient quantities and regularly available. so that they get good maggot yields that make consumers satisfied with the quality of maggot.

2. Pricing strategy

The price of maggot is determined according to the expenses that have been incurred during the production process and add a percentage to the profit to get a profit

3. Marketing strategy

Introduce more to consumers to increase income or more profit, provide the best service, implement a selling system by upholding honesty when explaining maggot in an honest manner, with this attitude consumers will be happy and like this place of cultivation.

We would like to thank MaarifHasyimLatif University and Mr. Bilal who has helped us in completing our research.

REFERENCES

- [1] Fatmasari, Lisa. 2017. Tingkat DensitasPopulasi, Bobot, Dan Panjang Maggot (*Hermetiaillucens*) Pada Media Yang Berbeda. Lampung.
- [2] Febra, Robiyanto. 2004. AkuntansiPraktisuntuk Usaha Kecil danMenengahStudi Nusa, Semarang.
- [3] Lexy, Moleong. 2002. MetodePenelitianKualitatif (Bandung: PT. RemajaRosdaKarya,
- [4] Mulyadi, Nitisusastro. 2010. Kewirausahaan&Manajemen Usaha Kecil, Alfabeta, Bandung.
- [5] PutriWahyuni Arnold, PinondangNainggolan, & Darwin Damanik. (2020). AnalisisKelayakan Usaha danStrategiPengembanganIndustri Kecil Tempe di KelurahanSetia Negara KecamatanSiantarSitalasari. *JurnalEkuiInomi*, 2(1), 29–39. <https://doi.org/10.36985/ekuiInomi.v2i1.349>
- [6] Rogério dos Santos Alves; Alex Soares de Souza, et all. (2014). HakikatPengembangan. *Igarss* 2014, 1, 1–5.
- [7] Sipayung, Pretty Yuniarti Elisabeth. 2015. “Pemanfaatan Larva Black Soldier Fly (*Hermetiaillucens*) Sebagai Salah SatuTeknologiReduksiSampah di Daerah Perkotaan”. Surabaya
- [8] Sugiyono, 2006. MetodePenelitianPendidikan; PendekatanKuantitatifdanKualitatifdan R&D, (Bandung: Alfabeta).
- [9] Tejo, Nurseto. 2004. StrategiMenumbuhkanWirausaha Kecil Menengah yang Tangguh!, dalam*JurnalEkonomi&Pendidikan* Vol.1 No.1 februari
- [10] TedjoTripomodanUdan. 2005. ManajemenStrategi, RekayasaSains, Bandung.
- [11] Viergina, NoveraVioListarin. 2020. PengaruhSampah, Buah Dan SayurTerhadapKandungan Protein Maggot TentaraHitam (*Hermetiaillucens*). Indralaya.