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Original Research Article

Maggot Cultivation: Qur'anic Economic Empowerment with Environmental Insight

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ABSTRACT

Environmental problems and unemployment are currently serious discussion. This is proven by the piling up of garbage as well as the high unemployment rate, especially in Banten Province. These two problems able to overcome by utilizing decomposer organism that have been created by Allah SWT, as we know is black soldier fly (BSF) or maggot. Unfortunately, the use of maggot to minimize waste and unemployment has not run optimally. The research method is using descriptive qualitative method. The information obtained through observation. Interviews, literature studies and documenting related to maggot cultivation. This research was conducted to overcome the problems of accumulating waste, it can also create jobs for the community through maggot cultivation. Based on the result of this research, cultivating maggot can open jobs and care on the environment. With the discovery that maggot cultivation can create jobs, it is hoped that one of the SDGs goals; decent work and economic growth that can be fulfilled. Besides that, it can minimize piles of waste, especially organic waste.

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1. INTRODUCTION

Environmental problems are a central issue widely discussed. The increasing amount of waste produced by humans every day leads to environmental pollution on land, water, and air. According to data published in the National Waste Management Information System (SIPSN), the national waste volume in 2022 reached 20,316,657 tons (Kementerian Lingkungan Hidup dan Kehutanan, 2022). This shows that the environment in Indonesia, including Banten Province, is already polluted due to waste.

In addition to waste in the form of industrial waste, Banten is also plagued by community waste issues. The high number of unemployed indicates the amount of community waste in Banten. According to the Central Bureau of Statistics (BPS), the Open Unemployment Rate (TPT) in Banten Province in February 2023 reached 7.97%. This figure ranks first among all provinces in Indonesia (BPS, 2023).

These two problems are actually interconnected in terms of resolution, which is by cultivating maggots. According to Wahyuni, maggots are the larvae of the black soldier fly. Throughout their lives, these animals consume organic food (Wahyuni, 2021, p. 9). Based on research conducted by Nila Rifatul Ulya, one of the maggot cultivation centers in Yogyakarta can generate a profit of Rp 2,862,333 per month in two production cycles, equivalent to a 51.57% profit margin (Ulya, 2022, p. 1). By cultivating maggots on a large scale, job opportunities will be available for the unemployed in Banten. This aligns with the Presidential Regulation on Coordination of Poverty Alleviation Number 13 of 2009 and coincides with one of the Sustainable Development Goals (SDGs), which is decent work and economic growth. Maggots or flies are indeed disgusting animals, but they have many benefits. Even Allah SWT mentions flies in His word, Q.S. Al-Hajj: 73, as a parable of Allah's greatness. This indicates a great potential in flies, including when they are in the larval form. Therefore, maggots are very worthy of cultivation, considering their potential for the environment and the economy.

2. LITERATURE REVIEW

The preparation of this scientific paper uses literature reviews from theories that serve as the basis for writing the scientific work. In addition, the literature review also includes national journals regarding the impact of maggot cultivation on environmentally conscious economic empowerment.

The research results used in the literature review for this scientific paper include strategies for maggot cultivation for economic resilience during the pandemic, written by Achmad Fathoni Rodli and Anita Mauliya Hanim (2021), in their journal titled "Development Strategy of BSF Maggot Cultivation for Economic Resilience During the Pandemic," which states that maggots have a high protein content and can survive in tropical climates like Indonesia. Maggots also consume organic waste, which can decompose organic waste and produce compost from the organic waste consumed by maggots.

Additionally, the thesis titled "Flies in the Qur'an (Analysis of Munasabah in Zaghlul al-Najjar's Scientific Interpretation of Surah Al-Hajj verse 73)" written by Jimmy Adam Dharmawan. This literature discusses the interpretation of scholars regarding the verse and the significance of flies being used as a parable in the Qur'an. The difference between this paper and that work lies in the specific focus on maggots and the discussion on maggot empowerment.

3. METHODS

This research was conducted at maggot cultivation centers in Banten Province. The study was carried out over 6 days, from May 19, 2023, to May 24, 2023. Data collection was done through literature study, observation, and interviews. Observations were conducted at several maggot cultivation sites in Banten Province. Interviews were conducted with sources related to this topic. Meanwhile, the literature study was carried out by reviewing written sources discussing maggot cultivation and its impact on the economy.

The data sources obtained include the results of observations, interviews, and literature studies in the form of several references, documentation, and discussions regarding the community's understanding of maggot cultivation. This research is compiled in a descriptive-qualitative manner. It is called descriptive-qualitative because this paper will describe maggot cultivation and emphasize its position from the perspective of the Qur'an.

5. RESULTS AND DISCUSSIONS

Maggots in Al-Quran Studies

Maggots are the larvae of the Black Soldier Fly (BSF), or more commonly known in Indonesian as the lalat tantara hitam (Yuswono, 2018, p. 1). The term "larva" refers to an immature insect (in the form of a caterpillar) that has just hatched from its egg (Tim Redaksi, 2008, p. 793). Maggots, which consume and decompose organic waste, possess bioconversion properties, functioning as decomposer organisms (Sarasi, 2022, p. 423).

Image 1: Black Soldier Fly in larval (maggot), pupal, and adult phases
(Author's Documentation)

Fly larvae, more commonly known as maggots, are not pests that can damage plants. Maggots can also be cultivated in Indonesia because this type of insect can survive in tropical climates (Fauzi, 2019, p. 2). As mentioned earlier, maggots have the potential to decompose organic waste. Their role as decomposers indicates their significant contribution to environmental balance. Maggots decompose organic waste more quickly than other decomposer microorganisms like worms, ants, or bacteria. This demonstrates that maggots positively impact the environment.

This phenomenon is one of Allah's powers in creating various living beings, some are beautiful and others are repulsive like flies. Even flies serve as an example of His greatness, as mentioned in Q.S. Al-Hajj [22] verse 73:

يٰٓاَيُّهَا النَّاسُ ضُرِبَ مَثَلٌ فَاسْتَمِعُوْا لَه اِنَّ الَّذِيْنَ تَدْعُوْنَ مِنْ دُوْنِ اللّٰهِ لَنْ يَّخْلُقُوْا ذُبَابًا وَّلَوِ
اجْتَمَعُوْا لَه ۗ وَاِنْ يَّسْلُبْهُمُ الذُّبَابُ شَيْـًٔا لَّا يَسْتَنْقِذُوْهُ مِنْهُ ۗ ضَعُفَ الطَّالِبُ وَالْمَطْلُوْبُ

Translation: *"O mankind, a parable is presented, so listen to it. Indeed, those you invoke besides Allah will never create [as much as] a fly, even if they gathered together for that purpose. And if the fly should steal away from them a [tiny] thing, they could not recover it from him. Weak are the pursuer and pursued."* (Q.S. Al-Hajj [22]: 73) (Kementerian Agama Republik Indonesia, 2017, p. 271).

The meaning of this verse is explained in Tafsir Al-Muyassar, stating that statues worshiped by humans cannot create even a fly, which has many deficiencies, such as being repulsive, insignificant, dirty, and small (Basyir, 2011, p. 559). According to Sayyid Quthub, quoted by Quraish Shihab, flies give an impression of weakness compared to wild animals. Flies also carry germs and diseases that can take away precious things from humans, yet flies are said to have secrets that remain undisclosed (Shihab, 2017a, p. 252).

Apart from the attributes mentioned in the Qur'an, maggots, or fly larvae, have many beneficial properties for humans. Part of the fly life cycle, maggots, help produce solid and liquid compost by decomposing organic waste, as 1 kg of organic waste can be consumed by 10,000 maggots within 24 hours (Kusumawati, 2020, p. 4). In addition to being used for organic waste management, according to Amandanisa, maggots are also excellent as fish and poultry feed because they contain high protein and nutrients. Fresh maggots contain about 43% protein, while processed into fish pellets, the protein content ranges from 30% to 40%. Fish and poultry feed from maggots can be sold to meet the financial needs of the community (Amandanisa, 2020, p. 797). Therefore, maggots not only contribute to environmental conservation but also significantly impact the economic well-being of the community.

Maggot nutritional content

Age (Days)	Rate (%)			
	Dry Matter	Crude Protein	Crude Fat	Crude Ash
5	26,61	61,42	13,37	11,03
10	37,66	44,44	14,60	8,62
15	37,94	44,01	19,61	7,65
20	39,20	42,07	23,94	11,36
25	39,97	45,87	27,50	9,91

Table 1. Percentage of nutritional levels in maggots

The Role of Maggots in the Environment and Economy

As previously mentioned, waste management is a serious issue for Indonesia. Improper waste processing exacerbates the problem. Most people use landfilling as the primary method of waste management, which is highly ineffective as it causes air pollution, contaminates water, and produces unpleasant odors along the roads (Siswanto, 2022, p. 193).

The lack of education from the government leads to a lack of awareness about the importance of waste management. The phenomenon of littering is becoming more common. People deliberately bring their waste from home and dispose of it on the roadside or into the sea. This practice is highly inappropriate as it damages the environment, and humans will eventually suffer the consequences. Allah says in Q.S. Ar-Rum [30] verse 41:

ظَهَرَ الْفَسَادُ فِي الْبَرِّ وَالْبَحْرِ بِمَا كَسَبَتْ اَيْدِى النَّاسِ لِيُذِيْقَهُمْ بَعْضَ الَّذِيْ عَمِلُوْا لَعَلَّهُمْ يَرْجِعُوْنَ

Translation*: "Corruption has appeared throughout the land and sea by [reason of] what the hands of people have earned so He may let them taste part of [the consequence of] what they have done that perhaps they will return [to righteousness]." (Q.S. Ar-Rum: 41) (Kementerian Agama Republik Indonesia, 2017, p. 235).*

Quraish Shihab explains the meaning of this verse in Tafsir Al-Mishbah, stating that human actions significantly impact the surrounding environment. Pollution on land and sea is clear evidence of human actions. The words of Ibn 'Ashur, quoted by Quraish Shihab, also state that Allah created the universe with a precise system, but humans ruin it with their bad deeds, leading to an imbalance in the natural system (Shihab, 2017b, p. 257).

Image 2. Waste piled up on the roadside
(Author's Documentation)

Recycling non-organic waste helps reduce waste accumulation, but the main problem causing environmental damage is poorly managed wet waste (Rosmaya, 2022, p. 1074). This issue is worsened by the large amount of organic waste, especially food waste, in Indonesia. Based on data from the Environment and Forestry Service (DLHK), 41% of waste is organic food waste (Kehutanan, 2022).

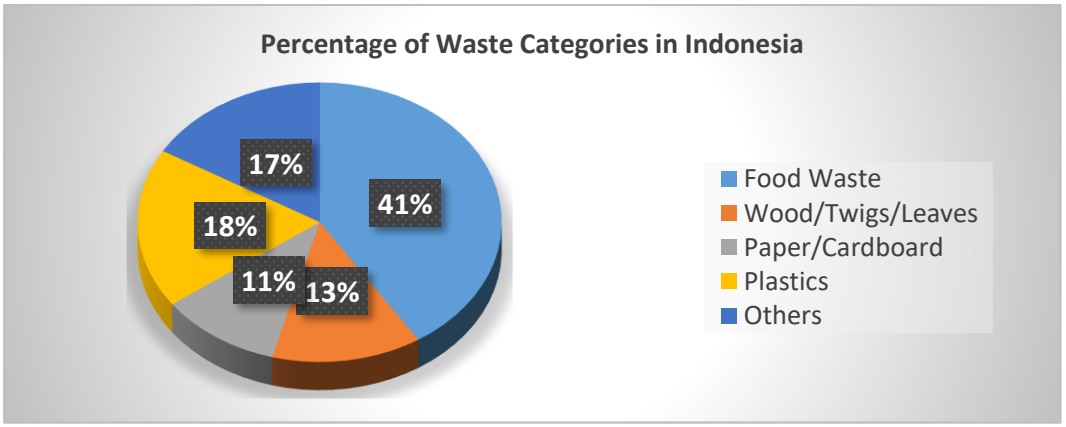

Figure 3. Graph of waste categories in Indonesia

Food waste can be managed by using maggots as biological wet waste processors. However, the lack of public knowledge about this causes organic waste to accumulate and pollute the environment. Besides addressing household and traditional market waste issues, maggots can also reduce unemployment by creating new job opportunities for the productive age group (Ramadani, 2021, p. 49). Reducing unemployment enables local communities to meet their needs and improve their standard of living, indicating that maggots play a role in both environmental conservation and economic growth.

Maggots are said to play a role in the economy due to their advantages, such as their ability to reduce organic waste. With the presence of organic waste, communities can easily obtain maggots for cultivation. These larvae do not carry diseases and have high protein content, making them suitable for poultry and fish feed. Additionally, maggots can be sold as fishing bait (Rodli, 2021, p. 12).

The significant benefits of maggots can be utilized to meet human needs. Every individual has the right to use natural resources, especially maggots, for their economic needs. However, utilizing these resources must be done in a measured, orderly, and structured manner to prevent damage. Allah created living beings and their environments with a purpose and benefit for human welfare (Iqbal, 2020, p. 9). This is stated in His word, Q.S. Al-Ahqaf [46]: 3:

مَا خَلَقْنَا السَّمٰوٰتِ وَالْاَرْضَ وَمَا بَيْنَهُمَآ اِلَّا بِالْحَقِّ وَاَجَلٍ مُّسَمًّىۗ وَالَّذِيْنَ كَفَرُوْا عَمَّآ اُنْذِرُوْا مُعْرِضُوْنَ

Translation: *"We did not create the heavens and earth and what is between them except in truth and [for] a specified term. But those who disbelieve, from that of which they are warned, are turning away." (Q.S. Al-Ahqaf[46]: 3) (Kementerian Agama Republik Indonesia, 2017, p. 400).*

According to Ibn Ashur in Tafsir At-Tahrir wa Tanwir, the phrase "heavens and earth and what is between them" includes the creatures Allah created (Ibnu 'Asyur, 1984, p. 18). Similarly, Wahbah Zuhaili states that the creation of the universe and all creatures within it aligns with Allah's will, not in vain or purposeless (Az-Zuhaili, 2003, p. 280). It can be understood that every living being created by Allah has a purpose and benefit. Even small and repulsive creatures like maggots have specific benefits, particularly in improving the community's economy.

The utilization of maggots as waste decomposers and animal feed has been implemented in several cultivation centers. One such center is Maggot Kranggot located in Jombang District, Cilegon City. Maggot Kranggot employs three people to manage the cultivation. Another center is Maggot Putra Putri Cikuya, located in Taman Adiyasa Housing, Cikuya Village, Solear District, Tangerang Regency. In this village, maggots are cultivated for sale as animal feed while empowering the local community. The maggot cultivation in Cikuya Village was established in 2021 and employs 16 workers.

By cultivating maggots, their advantages can be maximized for the community's livelihood. Besides being easy to breed using organic waste, maggots also serve as fish and poultry feed, which has high market value. Therefore, the community can be empowered by the potential of maggots to minimize unemployment rates in Indonesia, especially in Banten Province.

Decent Work and Economic Growth in Banten Province

When discussing economic growth, it inevitably involves how humans sustain themselves on this earth. Humans were created by Allah solely to worship Him. However, forms of worship are diverse, including working hard. In meeting daily economic needs, humans are indeed commanded by Allah to always work hard. This is stated in the Quran, Surah At-Taubah [9]: 105:

وَقُلِ اعْمَلُوْا فَسَيَرَى اللّٰهُ عَمَلَكُمْ وَرَسُوْلُهٗ وَالْمُؤْمِنُوْنَۗ وَسَتُرَدُّوْنَ اِلٰى عٰلِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُوْنَ

Translation: *"And say, 'Do [as you will], for Allah will see your deeds, and [so will] His Messenger and the believers. And you will be returned to the Knower of the unseen and the witnessed, and He will inform you of what you used to do." (Q.S. At-Taubah [9]: 105) (Kementerian Agama Republik Indonesia, 2017, p. 203).*

This verse is explained in Tafsir Al-Mishbah, stating that repentance and performing activities such as paying zakat and giving alms are encouraged by the Quran for humans. In addition, it also calls for engaging in other activities like entrepreneurship and working hard to meet one's needs (Shihab,

2017c, p. 237). The Prophet is commanded by Allah to call those who avoid jihad to act for Allah with jihad that He approves, such as obedience and fulfilling His commands (Basyir, 2011, p. 9).

Working hard is a command from Allah, which can be manifested by utilizing the available natural resources, such as the potential of maggots. The potential of this repugnant creature plays a significant role in realizing economic growth and creating job opportunities. Therefore, maggot cultivation can become the economic foundation for society today.

The maggot harvest process can begin two weeks after hatching; they are harvested at around 10 to 15 days old and measure approximately 2.5 cm (Sholahudin, 2021, p. 164). Around 1 ton of maggots will need about 1 ton of organic waste as food. This indicates that 1 ton of maggots can decompose 1 ton of organic waste (Ramadani, 2021, p. 53). Maggot cultivation activities produce various products that can be sold, including:

MAGGOT CULTIVATION PRODUCTS

No.	Product	Description	Use	Remarks
1.	Fresh Larva	Live maggots are 10 – 14 days old	Animal feed, especially fish and poultry	Basic Products
2.	Dry Larva	Maggots are dried so they last longer	Animal feed, especially fish and poultry	Basic Products
3.	Kasgot	Maggot digestive waste	Plant fertilizer	Basic Products
4.	Maggot Meal (Powder)	Dried maggots ground into flour	Raw materials for pellets or other animal feed	Derivative Products
5.	Maggot Oil	Maggots are extracted and their oil is taken	Treatment and body care	Derivative Products

Table 2: Various products from maggot cultivation

Dry maggot, this product is made from BSF larvae, dried and processed 100% without chemicals. Dry maggot is used as a high-protein feed ingredient, suitable for ornamental fish, poultry, reptiles, and cats. Fresh maggot (live maggot): This product can be directly given to poultry, fish, and reptiles or processed into dry maggot.

Magalarva maggot meal, this product is made from fresh maggots, starting from washing to the powdering process. Maggot meal can be used as a raw ingredient mixed with other components and given to pets. This maggot meal also has energy and protein content that can accelerate livestock growth. Then, organic kasgot fertilizer: This is the result of the bioconversion of organic waste using maggot larvae. This type of fertilizer is environmentally friendly because it is 100% natural without any chemicals that can harm plants (Kristiningrum, 2022, p. 33).

The products resulting from maggot cultivation can be sold at appropriate prices. If 1 kg of maggots can be sold for IDR 5000, and 1 ton of maggots can be produced daily, then the daily income would be IDR 500,000. Assuming this income for a month, it could reach about IDR 15 million per month (Ramadani, 2021, p. 53).

According to Mrs. Nurofiqoh, a maggot cultivator the author met, maggots from eggs to pre-pupa have market value, and even the kasgot can be sold as organic fertilizer. No emissions or pollutants are wasted from maggot cultivation; everything is beneficial and used. This maggot cultivator sells fresh maggots for IDR 9,000/kg, while dry maggots are sold at a higher price due to the additional processing required. These dry maggots can even be exported abroad at high prices.

The market for maggots is rapidly increasing, with several processes for producing maggot products such as maggot meal and dry maggots. Therefore, there is a need for suitable labor to ensure maggot cultivation runs smoothly, indicating that maggot cultivation can create job opportunities for the community. This aligns with Government Regulation on Poverty Alleviation Coordination Number 13 of 2009 and is included in one of the 17 goals in the SDGs, eighth purpose namely decent work and economic growth.

Several regencies/cities in Banten Province have implemented maggot cultivation, such as Tangerang Regency, Cilegon City, and Tangerang City, and even outside Banten Province, achieving satisfying results. However, maggot cultivation has not been evenly implemented in Banten, such as in Serang Regency. Given that Serang Regency has the highest unemployment rate in Banten Province, the local government should implement maggot cultivation to create job opportunities for the people of Serang Regency.

Based on these facts, maggot cultivation can generate employment and alleviate poverty, especially in Banten. However, without efforts from the government and the community to cultivate this insect, maggot cultivation will not be maximized. Therefore, the author offers several solutions to ensure effective maggot cultivation and address waste and poverty issues, including:

Firstly, increasing awareness among the people of Banten Province about maintaining their environment. Humans have the obligation to preserve the environment, as no one else can do it except humans as the earth's inhabitants. Those who damage the earth are highly disliked by Allah, as stated in His words, Q.S. Al-Baqarah [2] verse 205:

وَاِذَا تَوَلّٰى سَعٰى فِى الْاَرْضِ لِيُفْسِدَ فِيْهَا وَيُهْلِكَ الْحَرْثَ وَالنَّسْلَۗ وَاللّٰهُ لَا يُحِبُّ الْفَسَادَ

Translation: *"And when he goes away, he strives throughout the land to cause corruption therein and destroy crops and animals. And Allah does not like corruption," (Q.S. Al-Baqarah [2]: 205) (Kemenag RI, 2017: 24).*

Second, there needs to be education for the community in separating organic and non-organic waste. This education is necessary because both types of waste can be managed. The waste management process is known as the 3R method (reduce, reuse, recycle). This can be done by separating non-organic and organic waste to make it easier to manage (Yuwana, 2021, p. 65). Thus, maggot cultivators can easily obtain feed for maggot cultivation.

Third, socialization and digital literacy regarding the benefits of maggots. The lack of public knowledge about the benefits of maggots as organic waste decomposers and their potential for cultivation for financial needs can be addressed through socialization by authorities such as the government in Banten Province to the community, to utilize maggots in the bioconversion process of organic waste. Then, digital literacy is also very important regarding the dissemination of information about the benefits of maggots, considering the current era is all digital. Thus, providing understanding to the community about the benefits of maggot cultivation (Dewi, 2022, p. 156).

Fourth, the establishment of maggot cultivation institutions. To address the high unemployment rate, especially in Banten Province, and considering the bioconversion of organic waste using maggots, there is a great opportunity for the community to create job opportunities (Sitompul, 2022, p. 119). This can be done by forming maggot cultivation institutions in each city/regency in Banten Province. With the existence of these institutions, the community will be given training on the utilization of organic waste for maggot cultivation. After that, the community is expected to open maggot businesses by cultivating them.

Fifth, expanding the maggot market to international levels. Seeing the enormous and profitable potential of maggots, such as fresh maggots and dried maggots which have the potential as animal feed ingredients, then can be made into high-protein maggot flour, and even kasgot that can be used as organic plant fertilizer (Amandanisa, 2020, p. 2). It is very unfortunate if this maggot potential is only marketed domestically, so there needs to be an expansion of maggot marketing to international levels to generate larger incomes and employ more workers. This can be achieved by increasing social networks, utilizing technology such as online shops so that maggot marketing can be expanded internationally.

These five solutions are expected to be well implemented. The role of the government, media, and community in developing maggot cultivation both as environmental preservation and as economic empowerment is very important. These two expectations are in line with the SDGs goals, namely climate action and decent work and economic growth. With the implementation of good maggot cultivation and its marketing expansion to international levels, it is hoped to reduce waste and poverty rates in Indonesia, especially in Banten.

6. CONCLUSION

Every living creature created by Allah surely has benefits, even if the creature is considered disgusting. Flies, which are deemed disgusting by the majority of people, actually bring benefits to life. Flies are even mentioned in one verse of the Qur'an as a sign of the Creator's power, reminding His servants not to worship statues that cannot create any creature, whether beautiful or ugly. Moreover, fly larvae (maggots) have significant benefits both environmentally and economically. Maggots can decompose organic waste and produce products that can be sold and have economic value. The potential of maggots can be turned into decent job opportunities for the community, as outlined in the 17 SDGs goals. This can be achieved by cultivating maggots on a large scale, thereby employing more people. Such activities can be maximized with contributions from both the government and the community in managing organic waste and the community's economy.

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