Development of Maggot as an Alternative for Catfish Feed Cultivation on Narrow Land, Caturtunggal, Depok, Sleman, Yogyakarta

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ABSTRACT

Generally, catfish farming is carried out in large areas using artificial feed. Limited land is one of the obstacles in cultivating catfish, one of which is in the Karanggayam area, Caturtunggal. A method that can be used to cultivate catfish on narrow lands is the *Budikdamber* method, stands for *"budi daya ikan dalam ember"* in Bahasa which means fish farming in buckets. Using artificial feed in this fish farming method makes the bucket dirty faster and has a high economic value. Insect-based feeds such as maggot are cheaper alternatives, have high nutritional value, and do not pollute the water used in fish cultivation. This program aims to provide an understanding to the public regarding the development of alternative fish feed from maggots. This community service program was carried out in collaboration with the Kuncup Mekar Women Farmers Group in Karanggayam hamlet, Caturtunggal, Depok, Sleman, Yogyakarta. Based on the results of this service, the community is enthusiastic about participating in the maggot development program as an alternative feed for catfish farming in buckets in Karanggayam. The community feels the benefits of this program, including new knowledge and understanding of maggot cultivation as a whole to be used as an alternative feed with high protein nutrition and relatively cheap and easy-to-do cultivation costs. This supports catfish cultivation in buckets by fulfilling alternative feeds from maggots. The advice for further activities is to hold massive maggot cultivation assistance at KWT Kuncup Mekar and increase catfish and maggot production.

Keywords: *Budikdamber,* Catfish, Caturtunggal, Maggot, Narrow land

1 Introduction

The Covid-19 pandemic has impacted people's socioeconomic conditions in various countries, including Indonesia. One of the impacts felt is declining economic growth [1]. The necessities of life that need to be fulfilled amid declining economic growth make people must continue to move to maximize their existing potential. For example, Karanggayam Hamlet, Caturtunggal Kalurahan is a narrow area of land where this area is a boarding house area, so the land around the house's yard is minimal.

However, this limited land gives Karanggayam Hamlet an alternative potential for narrow land use by cultivating catfish in buckets. This activity can generate new knowledge for the community in creating food self-sufficiency [2]. Due to limited land, catfish farming is carried out using bucket media or what is commonly called BUDIKDAMBER Fish Cultivation in Buckets. Cultivating fish in a bucket using simple and easy-to-obtain tools and materials makes it easy to implement according to its function [3].

The use of buckets in catfish farming makes it more efficient in using water and easy for the community to do independently [4]. The application of fish farming in a bucket which is simple enough to be implemented by the community independently, can be used to achieve food security for the community [5]. For example, cultivating fish in buckets is a simple urban farming method and does not require large land areas to raise catfish [6].

It is necessary to have environmentally friendly, safe, and affordable feed to support the need for fish feed in fish farming in buckets. In addition, a sector of insects with their abilities can be utilized to produce food chains through their potential to recycle organic waste into biomass that can be used as fish feed [7].

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We use black soldier fly (*Hermetia illucens*) to cultivate fish in buckets. Derivatives of protein larvae will be used as ingredients to obtain catfish feed to replace artificial feed. Using the black soldier fly will ultimately provide multiple benefits, namely producing feed for fish and maintaining the environment through recycling organic waste into biomass [7]. Protein from black soldier flies in several European countries is a protein material that has high value as an element in pet feed and aquaculture plants [8].

Therefore, the community service team from the Faculty of Biology is trying to use the existing potential to apply appropriate technology for developing maggots as an alternative feed for catfish farming in the narrow land area of Karanggayam Hamlet. This program aims to educate the public to take advantage of the local potential to produce alternative, more affordable feeds and has high-quality values for fish farming. In addition, it is hoped that this program will become a sustainable activity in supporting the economy of rural communities in Karanggayam Hamlet.

2 Methodology

This activity was carried out in collaboration with the Kuncup Mekar Women Farmers Group in Karanggayam Hamlet, Caturtunggal Village, Depok, Sleman, Yogyakarta. The method of implementing activities is divided into stages, that is:

2.1 Socialization of the program

Program socialization activities were conducted using a training method titled "Integrated Farming System: Development of Maggot for Alternative Feed for Catfish Cultivation in Buckets". This program was attended by Mr. Priyanto, the head of the Karanggayam hamlet, Mr. Harjono, the head of Neighborhood Unit 11 Community Unit 2, and 14 residents of Karanggayam Neighborhood Unit 11 Community Unit 2 and members of the Kuncup Mekar Women Farmers Group (KWT).

2.2 Provision of buckets, catfish seeds, and catfish feed

Assisting with buckets, seeds, and catfish feed aims to stimulate the community so people can directly practice cultivating catfish using buckets.

2.3 Construction of a maggot cultivation cage

The construction of maggot cultivation cages is part of the program implementation. The maggot cultivation cage was built at the Kuncup Mekar Women Farmer Group (KWT) Karanggayam Neighborhood Unit 11, consisting of a rearing rack and BSF flies mating cages.

2.4 Intensive assistance

Intensive assistance is carried out to find existing problems related to the sustainability of catfish and maggot cultivation and then look for joint solutions to these problems. This assistance helps the community to be able to resolve appropriately when a problem occurs.

2.5 Monitoring and evaluation

Program monitoring and evaluation are carried out to monitor the progress of program implementation. This activity involved informal discussions with administrators and community members directly involved in the program. Based on the monitoring and evaluation results, this will form the basis for future program development. Targets and outputs achieved in this program include:

- The maggot development program for catfish farming in the narrow area of Karanggayam Neighborhood Unit 11, Caturtunggal, will continue until the community can cultivate maggot and catfish professionally to meet fish protein needs.

- Increasing food self-sufficiency, building an entrepreneurial spirit, and preserving the environment by utilizing organic waste for maggot cultivation.

3 Theory

Maggots, specifically black soldier fly larvae, have been proposed as a feed alternative for fish and other animals in aquaculture and livestock farming. These insects have a high protein and lipid content, and their production requires less land, water, and feed inputs than traditional protein sources such as soy and corn. One study found that black soldier fly larvae can be an adequate replacement for fishmeal in the diet of rainbow trout (*Oncorhynchus mykiss*). The larvae were able to support the growth and survival of the fish, and the inclusion of larvae in the diet resulted in improved feed efficiency and reduced nitrogen excretion compared to a fishmeal-based diet [9].

In addition to their use in aquaculture, maggots have also been proposed as a feed source for poultry and swine. A literature review found that black soldier flies larvae can be included in the diet of poultry as a protein source, with no negative effects on growth performance or meat quality [10]. Similarly, a study on swine found that replacing a portion of the soymeal in the diet with black soldier fly larvae resulted in improved feed efficiency and reduced nitrogen excretion.

It is important to note that using maggots as a feed alternative is still an ongoing research and development area. However, more studies are needed to fully understand this approach's potential benefits and limitations.

4 Results and Discussion

Program implementation is carried out in several activities, namely outreach, training, pilot projects, discussions, and evaluations. The training was carried out to provide the target community with comprehensive knowledge of catfish cultivation in buckets and maggot cultivation. The results of this activity include the following:

4.1 Socialization of catfish farming programs and training in buckets and maggot cultivation

The community has knowledge and experience regarding cultivating catfish on narrow lands. The education provided in this narrow field catfish cultivation stage includes preparing tools and materials, assembling the tools used before the catfish are stocked, and ethical knowledge starting from maintaining water quality, feeding techniques, and monitoring catfish behavior and mortality, as the socialization process shown in Figure 1. Cultivating fish in this bucket uses less water and is easily carried out by people with relatively cheap capital [4].

Figure 1: *Socialization of catfish farming programs and training in buckets and maggot cultivation*

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4.2 Catfish farming pilot project program in narrow land

The pilot project method aims to finalize preparations for running this program regarding infrastructure, such as tools and materials needed, and the readiness of residents who will run this program [11]. The limited land in Karanggayam hamlet has led to an application program being held so that it can be optimally applied in the future through the direct introduction to residents about catfish farming in this bucket [12]. There are four residents of Karangwuni and 16 residents of Karanggayam, Caturtunggal sub-district, who participated in carrying out this pilot project. This activity gives the community knowledge and experience using maggots in catfish farming on narrow lands. To carry out this program, the author provided the plastic buckets for the catfish, and the symbolic transfer is shown in Figure 2 below.

Figure 2: *Symbolizing the provision of catfish bucket assistance to Karanggayam residents*

4.3 Establishment of a maggot cage managed by members of the Kuncup Mekar Women Farmers Group

The establishment of a maggot cage managed by members of the Kuncup Mekar Women Farmers Group involves creating a controlled environment to breed and harvest maggots for various purposes, such as animal feed or waste management. This initiative is an innovative and sustainable approach that can benefit both the community and the environment. The Kuncup Mekar Women Farmers Group, comprising a group of women farmers, has taken the lead in setting up and managing the maggot cage project. The group members collaborate and work together to ensure the success of this venture. Here is a step-by-step overview of the establishment and management of the maggot cage:

a. Planning: The Kuncup Mekar Women Farmers Group starts by conducting thorough research on maggot farming and its potential benefits. They explore the market demand for maggots as animal feed or organic waste management solutions and identify potential customers or partners.

b. Location selection: The group identifies a suitable location for setting up the maggot cage. Factors such as accessibility, availability of resources, and proximity to potential customers or waste sources are taken into consideration.

c. Construction of the maggot cage: The group constructs a dedicated cage or structure for breeding maggots. The cage is designed to provide a controlled environment that is conducive to maggot growth and development. It may include compartments or trays for separating different stages of the maggot life cycle.

d. Sourcing maggots: The group sources initial batches of maggots from reputable suppliers or insect farms. These maggots serve as the breeding stock for the project.

e. Feeding and management: The Kuncup Mekar Women Farmers Group feeds the maggots a suitable diet, often consisting of organic waste materials. This waste could be sourced from local farms, food processing facilities, or restaurants, reducing organic waste and providing a sustainable food source for the maggots.

f. Harvesting and processing: Once the maggots have gone through their growth stages, they are harvested. The group collects and processes the mature maggots to prepare them for sale or use as catfish feed.

g. Monitoring and improvement: The group regularly monitors the maggot cage's performance, adjusting feeding practices, temperature, and other factors as needed. They also make improvements based on their suggestions.

Overall, the establishment of a maggot cage managed by members of the Kuncup Mekar Women Farmers Group provides a sustainable solution for both waste management and the production of valuable resources like animal feed. This initiative empowers women farmers to contribute to their community's economic growth and environmental sustainability. The maggot cultivation cage of rearing racks and BSF fly mating cages are shown in Figure 3 below.

Figure 3*: Maggot cultivation cage at KWT Kuncup Mekar Karanggayam RT 11, consisting of rearing racks and BSF fly mating cages*

4.4 The community knows how to cultivate maggot

Knowledge about maggot cultivation includes hatching eggs, maggot enlargement, selecting pupae that will become BSF flies, caring for BSF flies to produce lots of eggs, and how to harvest eggs. BSF are insects with larvae that can eat almost any organic material, including organic waste. The larvae are edible and can be given to fish and livestock; this will be used as feed in catfish farming in this program [13]. In addition, the larvae of the BSF fly have a unique and effective protein composition to protect against cell damage due to the host [8].

4.5 Program Discussion and Evaluation

Discussions were held with the management and members of the Women Farmer Group who were involved. Program evaluation is carried out by conducting discussions on the results of monitoring program progress. As a follow-up to this evaluation, plans and hopes for the future maggot development program for catfish farming in the narrow area of Karanggayam Neighborhood Unit 11, Caturtunggal, will continue until the community can professionally cultivate maggots and catfish. Therefore, it is expected to meet fish

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protein needs, increase food self-sufficiency, build entrepreneurial spirit, and preserve the environment by utilizing organic waste for maggot cultivation.

5 Conclusions

The development of maggot as an alternative feed for catfish farming on a narrow land, Caturtunggal sub-district, Depok, Sleman, Yogyakarta, has received enthusiasm from the community amid the conditions affected by the pandemic, which is still being felt to this day. This program allows the community to utilize narrow land to be more productive by cultivating catfish in buckets. The community expects the existence of this program as a means of generating the village economy in the future. Therefore, it is necessary to carry out massive assistance for maggot cultivation at KWT Kuncup Mekar to increase catfish and maggot production.

6 Declarations

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