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Technical Guidance on Making Small Pond Geomembrane Shrimp Ponds in Bades Village, Lumajang

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ABSTRACT

Cultivating vannamei shrimp has dominated fishery sectors and led to aquaculture development to enhance the Indonesian economy. Lumajang, specifically Bades Village, is one of the potential regions in Jawa Timur for improving fishery products because of its long shoreline of approximately 75km. Developing shrimp cultivation requires vast funds, intensive pond systems, and broad markets. Consequently, a large number of vannamei shrimp cultivation is controlled by a large company, which will supersede the role of traditional or local fishermen. This program utilizes two main methods: socializing about the opportunity of production, cultivation, and building a business entity of vannamei shrimp and practicing creating a small pond using geomembrane as a natural insulator. These activities intend to significantly increase the interest and enthusiasm of fishermen to develop vannamei small pond systems as a solution for economic independence and new income sources. As a result, a local fishing group, widely known as Mina Dampar as a partner, accepted and approved those programs implemented in their region in a 2000m2 land area.

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INTRODUCTION

Shrimp has become one of the major commodities of Indonesian fishery export. It can be seen that the data from the Central Bureau of Statistics (BPS) processed by the Directorate General of Strengthening the Competitiveness of Marine and Fishery Products (PDSPKP) showed the number of Indonesian shrimp exports in 2021 reached 38.98% of the fishery sector. These data explained that shrimp is crucial in fishery exports (DJPB, 2019). East Java Province is one of the first-rate contributors to the nation's shrimp production, around 30% of the total. The several cities that are the central location of vannamei shrimp cultivations are Tuban, Sidoarjo, Bangkalan, Sumenep, Pasuruan, Probolinggo, Situbondo, Banyuwangi, and Jember.

In Indonesia, vannamei shrimp is a popular fishery sector with economic value and great export opportunities. Vannamei shrimp has more advantages compared to other shrimps. For example, they can live and adapt to low temperatures, have a wide range of water salinity, and have a high survival rate.

Lumajang is one of the East Java locations with great potential for developing vannamei shrimp cultivation. Geographically, Lumajang is located in the center of East Java and is bordered by the South Sea. Furthermore, the development of the fishery economy relies on marine fishery products (53.96%) and freshwater aquaculture (30.58%), while the rest of those products are vannamei shrimp ponds (15%).

Nowadays, vannamei shrimp cultivation is possessed by large companies with huge funds, technologies, and markets. In Lumajang, the shrimp farming business is controlled by a big company. These conditions will supersede the role of traditional or local group fishermen to utilize their natural resources because of the limited access to funds, intensive technology systems, and global markets.

This program intends to encourage the development of a business startup in vannamei shrimp cultivation using a small pond-intensive system. In addition, its activities empower the local citizens to maximize the utilization of natural resources based on the area's potential. Eventually, the program can improve the economic rates of local citizens, particularly on the coastline.

LITERATURE REVIEW

A. Vannamei Shrimp

Vannamei shrimp (Litopenaeus vannamei) is a subtropic animal from the West Coast of America, starting from California Bay to South America. This shrimp has more advantages compared to other shrimps. For instance, they have strong disease resistance, so it is feasible to cultivate them.

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Vannamei shrimp has been a superior shrimp pond product since 2001. Moreover, the shrimp has rapid growth, which only takes approximately 100 days of breeding. Surprisingly, they are known as shrimp with low feed conversion (Perikanan, 2019).

Vannamei shrimp cultivation generally adopts two central systems: traditional and intensive methods. Traditional shrimp cultivation usually costs less than the intensive method. Nevertheless, they tend to have low stocking density and a low level of productivity. In contrast, the intensive system has high stocking density and high productivity. However, this method's drawbacks are spending a lot of money and a high death rate (Farionita, Aji, & Supriono, 2018).

One of the components that is the most crucial focus of development in aquaculture is providing nutrition to fish and shrimp. Feed costs are the highest operational cost item in aquaculture businesses that use semi-intensive and intensive systems. For this reason, a basic understanding of the nutritional needs and provision of fish and shrimp is needed in developing semi-intensive or intensive feeding systems. In extensive and semi-intensive pond cultivation systems, natural food organisms in fish and shrimp nutrition have an important role compared to intensive cultivation systems. Figure 1 shows the role of natural and artificial food organisms in each pond cultivation system (Tacon, 1987).

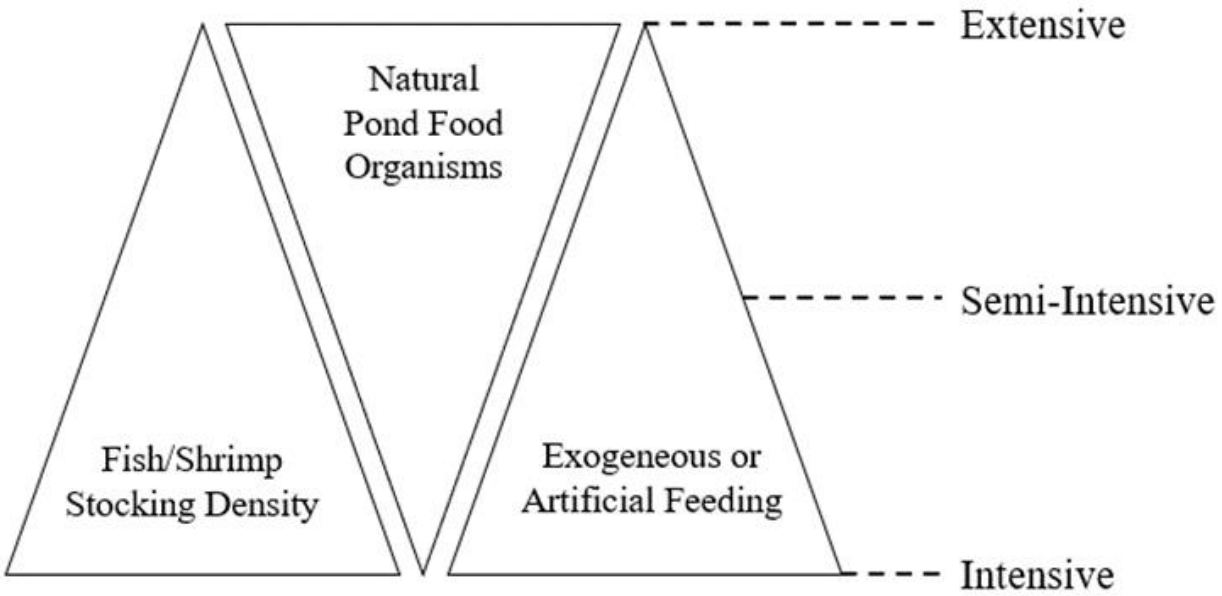

Figure 1.
The role of natural food organisms and artificial food in each pond cultivation system

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Traditional or extensive ponds primarily rely on natural feedings, with only a tiny proportion of additional feedings, so the supporting land is limited. In this system, there are no sterilization processes or biosecurity implementation. Stocking density is not more than five shrimps/m2. Meanwhile, in the intensive system, the proportion of feeding resources from commercial industries is hugely higher than that from natural resources. The more intensive the cultivation system is, the higher the technology and the management are, including the aerator/waterwheel, water pump, machine, and other tools (Davis, Amaya, Venero, Zelaya, & Rouse, 2006; Supono, 2017).

Subsequently, implementing an intensive system has to consider the implementation of good aquaculture practices (GAP), standard operating procedures (SOP), and biosecurity. As an impact, the excellent quality of shrimp ponds increases with the highest stocking density reaching more than 100 shrimps/m2, equivalent to more than 10 tons productivity/hectare. Consequently, it will precipitate and increase the risk of disease outbreaks. The waste of this system will stimulate harmful pathogens to decrease the shrimps' immune system.

Advancing vannamei shrimp with a small pond system intends to develop the technology for shrimp cultivation in the lower and middle-class people. This system can enhance the processing management of ponds, minimize the risk of disease, have a shorter breeding period, and efficiently consume rates.

B. Geomembrane Technology

Geomembrane is a polyethylene plastic layer known to have high durability, so its use can last quite a long time. Geomembrane is known to be better than tarpaulin and other plastics commonly used in aquaculture businesses. Geomembrane has many advantages in its application as a base material for pond ponds. A geomembrane is made from materials that do not have dangerous additives, can prevent pond water from seeping into the ground, and has high durability, where the geomembrane can last up to 10 years without replacement (Rianto, 2019). On the other hand, the geomembrane is vulnerable to physical damage from sharp objects, gravel or stones, and fire. This damage can result in holes or tears in specific parts, mainly caused by pressure from the material above. The damage can be repaired by applying a protective layer of sufficient thickness and adding additional plates (Abdullah & Susandini, 2018).

MATERIAL AND METHOD

This technical guidance program was conducted on September 18, 2022, in Port of Fishery (PPI) Bades Village, Pasirian Districts, Lumajang Regency. The target of this program is ten people who are incorporated into the fishermen group, namely "Mina Dampar." Moreover, community groups who are members of this activity include the "Mina Dampar" fishermen group, Lumajang District Fisheries

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Service staff (DKP Lumajang), activity implementing staff or mentors, and academics (lecturers and employees) from Jember University and Jember State Polytechnic. The method of this activity includes socialization by the activity mentor, who is a vannamei shrimp cultivation practitioner, and a field survey. Socialization intends to improve the fisherman's insight about using technology to cultivate vannamei shrimp and elucidate the technologies and tools used in the vannamei shrimp pond. The field survey was carried out to show the ideal location for building a vannamei shrimp pond so that activity participants had an idea of pond construction planning.

RESULT AND DISCUSSION

Today, in Indonesia, Vannamei shrimp cultivation has become one of the superior fishery products that can lead to the nation's economy. East Java is the second largest province contributing to the nation's shrimp production, accounting for 517.397 tons in 2019, and has been targeted to reach 1.290.000 tons in 2024 (DJPB Situbondo, 2021). In addition, the Marine and Fishery Department (DKP) data of East Java record that the number of ponds peaked at 57.343 hectares.

Geographically, Lumajang Regency is located in the 112°54’-113°23' East Longitude and 7°-54’.8°.23' South Latitude with an area of 1.790,98 km2. It is one of all East Java regencies with marine and coastal areas. The length of the southern coastline in Lumajang is approximately 75km. Bades Village is the center of productive marine and coastal areas. Around 33.46 km2 of areas have tremendous potential to be cultivated land, including intensive and semi-intensive systems of catfish, gourami, Nile tilapia, and vannamei shrimp commodities (Dinas Perikanan, 2020).

Bades Village is located in Pasirian Districts and has dominated the development of vannamei shrimp cultivation. It can be seen that there is a fishermen group widely known as "Mina Dampar."

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Figure 2.
Counselling to the Fishermen

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The counseling activities have been followed by ten people who joined the "Mina Dampar" fishermen group. Mina Dampar warmly welcomed our arrival and enthusiastically responded and accepted our idea regarding fishery affairs. Time by time, the fishermen have an enormous problem with their funds and limited access to them. They tend to organize conventional pond systems rather than intensive systems. Furthermore, the fishermen also do not have a wide range of markets, so they used to sell their products in the traditional markets.

Based on the data of Ditjen PDSPKP-KKP RI (Perikanan, 2019), there are wide varieties of shrimp products, including frozen shrimp and other products such as meatballs, dim sum, tempura, and shrimp rolls. In addition, the head, skin, leg, and nails, categorized as waste products, can be utilized in many products. For instance, the head can be processed to chitin chitosan, head shrimp flour, shrimp paste, and canned shrimp, and the skin can be processed to astaxanthin pigment and flavor enhancer.

The market opportunities for vannamei shrimp are widely open, including domestic and global markets. Domestic shrimp demands come from fish processing units (UPI), hotels, restaurants, catering, and household consumption. Meanwhile, the global market of Indonesian shrimp is dominated by the United States and Japan in frozen shrimp and its processed products. Several Asian countries, such as Malaysia, Hongkong, and Singapura, tend to buy shrimp in live conditions (Statistik, 2022).

Figure 3.
Surveying Pond Location

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These activities opened fishermen's horizons in the Bades Village to develop their shrimp ponds to be better and more efficient. One of the essential things to face in the competition of global markets and globalization is how to create effective production and quality assurance or food safety. The collaboration between universities, governments, and fishermen groups will perfectly actualize cultivating vannamei shrimp with a small pond and using a geomembrane.

In addition, these programs also give insight to fishermen about the technique of building vannamei shrimp cultivation with a small pond system and geomembrane. The crucial step in pond construction is selecting and deciding on a pond location. Ponds with great locations can be analyzed by their topographic level, soil content, and water availability. The sea needs a high water salinity level for places where it is difficult to find water instantly. Water availability can significantly decrease the production cost due to sterilization.

Shrimp ponds have different sizes in terms of the implemented management. Traditional ponds used to have roughly 1-1.5 ha in size and 0.8m in depth. Meanwhile, the intensive ponds are smaller than the traditional ones, around 1000-5000 m2 in size and 1.2-2.0 m in depth. The water depth is affected by the rate of stocking density. The higher the population is, the higher the water level is. According to (Brown, 1997), the depth of a semi-intensive pond is about 0.8-1.0 m, while the intensive system is around 1.5-2.0 m.

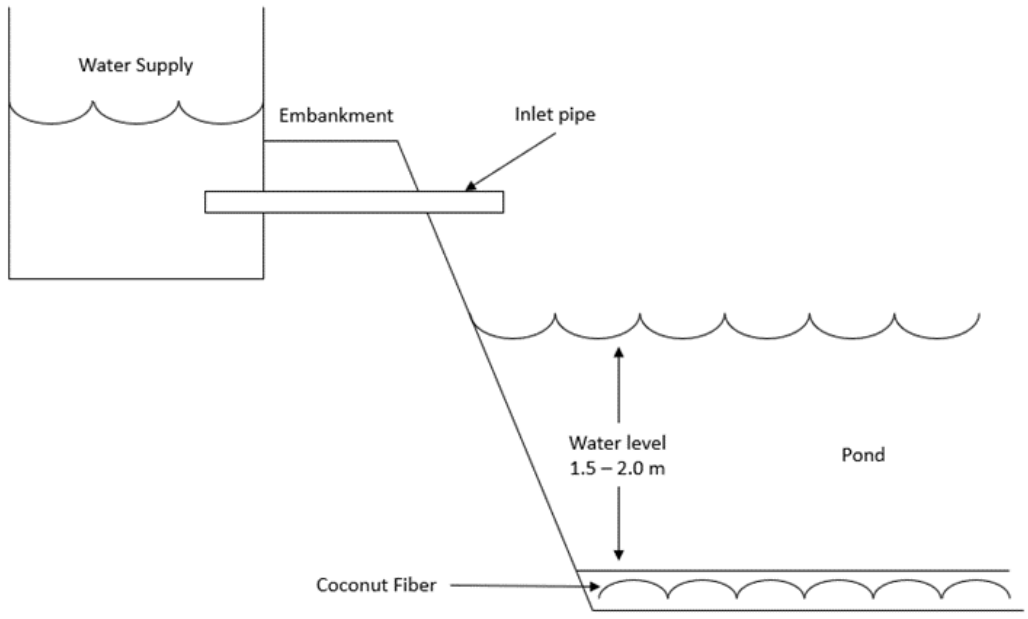

Figure 4.
The Pond Construction

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The slope of the pond dam has a standard ratio of 1:1.5 to 1:2 to prevent erosion. The quality of soil content determines this slope. In contrast, the intensive ponds, all members except breeding ponds, need a reservoir pond for around 30% of shrimp pond cultivation.

Pond elevation is the critical factor in gaining the excellent quality of pond construction. It makes entering the water from the reservoir and pond bottom drying easier so the dry system can be perfectly implemented.

CONCLUSION AND RECOMMENDATION

The programs were organized through socialization and practice for the fishermen group "Mina Dampar" in Bades Village, Pasirian Districts, Lumajang Regency. In the socialization process, the project team presents the materials regarding the potential chances of cultivation and business. At the same time, in the practice section, they explained the technique of developing vannamei shrimp cultivation with a small pond system and geomembrane as a natural insulator. As a partner, the fishermen group accepted and approved those programs implemented in those regions.

The recommendation for the following program is that they need a monitoring and evaluating system periodically to utilize advanced growth and solve the problems in shrimp cultivation. Furthermore, evaluation is required to produce various shrimp products and expand the broader markets.

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