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Evaluating Natural Feed for Crayfish Farming: Economic and Ecological Benefits

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Crayfish is an aquaculture commodity that has high economic value, with growing international market demand. However, the growth of these lobsters tends to be slow, both in terms of body length and weight, which is often caused by limited quality feed and high production costs. The use of alai feed, such as silkworms and other organic materials, can be a solution to improve cost efficiency and support more optimal lobster growth. In addition, natural feed offers ecological benefits by reducing water pollution and organic waste, as well as supporting the sustainability of local ecosystems. This approach also has the potential to reduce the risk of disease in lobsters, as natural feed is more in line with their biological diet. By improving production efficiency and supporting sustainable livelihoods, it is an environmentally and economically sound solution for the aquaculture sector.

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Keywords: Crayfish; natural feed; axiological; sustainability.

1. INTRODUCTION

Crayfish are included in fishery commodities that have high economic value, domestic and export market demand continues to increase so that crayfish have the potential to be developed as a cultivation commodity (Partini et al., 2019). Crayfish is one of the main ingredients for cooking or culinary because this lobster has its own characteristics and has a distinctive taste that is not found in other types of shrimp, this lobster has dense, savory, and tender meat and a very high nutritional content. Therefore, although the selling price of lobster is RS. 150,000/kg this commodity is sought after by consumers (Kuhu et al., 2019).

International market demand for crayfish has shown a significant increase, but current production levels have not been able to optimally meet these needs. Therefore, more intensive cultivation development is needed, including strategies to reduce production costs, especially in terms of the use of artificial feed which tends to be expensive. One of the main challenges in crayfish farming is the slow growth rate, both in terms of body length and body weight. This growth can be improved by providing feed that meets nutritional needs in adequate quantity and quality (Jones et al., 2002).

In Freshwater Lobster cultivation activities, feed is a very important part and supports cultivation activities because feed occupies 60-70% of the production costs that must be incurred (Yusuf & Alimuddin, 2022). Therefore, to reduce the cost of using artificial feed, utilization of natural feed can be done.

The use of natural feed such as silkworms (*Tubifex* sp.), earthworms, and organic waste offers a more economical and environmentally friendly alternative solution. Natural feed not only fulfills the nutritional needs of lobsters optimally, but also supports the balance of aquaculture ecosystems through organic waste management. From an axiological perspective, the utilization of natural feed reflects the ethical responsibility of humans in utilizing local resources wisely, while preserving the environment and supporting the sustainability of the aquaculture sector.

Based on the axiology perspective, the use of natural food not only requires lobster nutrition, but also reflects ethical and aesthetic values. Ethical values lie in the responsibility to utilize sustainable local resources, reduce environmental impacts, and support ecosystem balance. For example, the utilization of earthworms, azolla, or maggots based on organic waste provides an environmentally friendly solution and supports resource circularity. Meanwhile, the aesthetic value is related to preserving the beauty of freshwater ecosystems through better waste management and reducing feed-induced eutrophication.

Research shows that natural food such as silk worms, earthworms and certain leaves have suitable nutrient content for crayfish growth, with good feed conversion efficiency and minimal impact on the environment. As such, this axiology-based approach promotes a balance between economic benefits and environmental conservation, supporting more equitable and sustainable aquaculture practices.

2. MATERIALS AND METHODS

This research method is Qualitative research using the literature study method. Qualitative research is a research process to understand human or social phenomena by creating a comprehensive and complex picture that can be presented in words, reporting detailed views obtained from informant sources, and carried out in a natural setting (Rijal & Fadli, 2021). Literature study is research conducted by examining various literature studies needed in research (Nurjanah & Mukarromah, 2021).

3. RESULTS AND DISCUSSION

Axiology comes from Greek, Axion which means value and logos which means science (Anim et al., 2021). Axiology is a branch of philosophy that talks about the orientation or value of a life (Erlin, 2018). The definition of axiology is a theory of value that deals with the use of knowledge obtained (Abadi, 2016). Axiology in the use of natural feed for crayfish farming involves ethical considerations and moral principles related to the use of natural feed as food for crayfish.

Based on the results of the literature study, the growth of crayfish has a very slow growth and has decreased due to the limitations of superior seeds, both in terms of quality, quantity and continuity. One factor that makes the quality of seeds superior is feed. Feed that suits the needs

of crayfish will produce optimal growth. The feed needed for growth must be of high quality and have a relatively low cost so that the crayfish business can be made a sustainable business (Mamonto et al., 2023).

The application of axiological principles centers on the utilitarian use of values that produce maximum benefits for all parties involved. The main values are Economic Value, Ecological Value, Social Value, Animal Welfare, and Cultural Sustainability.

3.1 Economic Value

The use of natural feeds has high economic value because the raw materials can be obtained from locally available organic waste. For example, silkworms can be cultured using sludge media or organic wastes that are cheap and easily accessible. This allows farmers to drastically reduce feed costs, which is the largest component of aquaculture production costs. The use of natural feed has great potential in supporting cost efficiency in crayfish farming while increasing growth rates. One example of an effective natural feed is silkworms (*Tubifex* sp.), which can be cultivated independently using simple media such as mud or organic waste. This method not only reduces production costs, but also provides a high-quality source of nutrients that support optimal growth of crayfish. Protein requirements needed for Freshwater Crayfish range from 20-40%, the type of feed that can provide optimal growth and health for Freshwater Crayfish generally contains carbohydrate protein, fat, vitamins and minerals (Taufiq et al., 2016). In addition, silkworms have a high protein content that can promote faster growth. According to (Cahyono et al., 2015), silkworms have a fairly high nutritional content, namely protein reaching 57%, fat 13.3%, and crude 2.04%, ash content 3.6% and water 87.7%.

3.2 Ecological Value

Natural feed makes a significant contribution to reducing pollution and supporting environmental sustainability. Natural feed residues, such as vegetables, are easily biodegradable, resulting in a lower risk of water pollution in culture ponds and sewers. In addition, vegetable waste that was previously considered worthless can be utilized as feed ingredients, reducing the amount of organic waste generated. The cultivation of natural feed, such as plankton or silkworms (*Tubifex* sp.), does not destroy native habitats as it can be done on a small scale, while supporting the preservation of local ecosystems. This approach is not only environmentally friendly, but also strengthens resource efficiency in aquaculture systems.

3.3 Animal Welfare

The natural feed used in crayfish farming is closer to their natural diet in their natural habitat. Crayfish are omnivorous animals that naturally consume a variety of organic materials, including worms and aquatic plants. The choice of natural feed not only meets the optimal nutritional needs but also supports the natural feeding behavior of crayfish, thereby improving animal welfare and efficiency in aquaculture. Natural animal feeds that are favored by lobsters are silk worms (*Tubifex* sp.), water worms, earthworms, and plankton. The most popular plant-based natural foods are moss and roots (Yusapri et al., 2022). Yusuf & Alimuddin, (2022) also added, that in their original environment they eat anything such as roots, leaves, meat, fish and worms. So that the use of natural feed can improve the quality of life of crayfish by providing nutrients that are more balanced and in accordance with their biological needs. Natural feed also contributes to a reduced risk of disease, as its nutritional content helps maintain the health of the crayfish and reduces stress levels that are often a trigger for various health problems. This approach supports a more sustainable and animal welfare-oriented farming system.

3.4 Aquaculture Sustainability

Sustainability in crayfish farming is an integrated approach that aims to maintain a balance between economic, environmental and social aspects of aquaculture management. The ultimate goal is to ensure that aquaculture systems can continue to operate in the long term without damaging the ecosystem, reduce dependence on unsustainable external resources, and still provide economic and social benefits to society.

Sustainability in crayfish farming includes not only production efficiency, but also ecological and social aspects. By utilizing natural feed, farmers can reduce costs, increase productivity, while maintaining ecosystem balance. The use of natural feed in crayfish farming has great potential to support the sustainability of the aquaculture sector. Natural feed can reduce

negative impacts on the environment, especially the waste generated by artificial feed, which is often the cause of pollution. In addition, this approach increases the efficiency of local resource utilization, making it a solution that supports environmental and socio-economic sustainability, and contributes to the livelihood of communities that depend on aquaculture activities.

Sustainability in aquaculture also includes wiser management of natural resources. The use of natural feed is one effective way to reduce the ecological impact of lobster farming. In addition, natural feeds such as silk worms or maggots also reduce dependence on imported raw materials, such as fishmeal, which often come from unsustainable marine resources.

Sustainability in aquaculture also depends on appropriate policy support from the government. Policies that support research and development in sustainable aquaculture as well as incentives for green technologies can facilitate the adoption of more efficient and sustainable aquaculture practices. This support also includes policies that regulate the sustainable use of natural resources and maintain the integrity of aquatic ecosystems.

4. CONCLUSION

The use of natural feed in crayfish farming provides many advantages, both in terms of economics, ecology, and sustainability. Natural feed such as silk worms and other organic materials can reduce production costs and support more optimal lobster growth. In addition, this approach has the potential to reduce negative impacts on the environment, such as pollution from artificial feed waste, and support the sustainability of local ecosystems. The application of natural feed is also in accordance with the biological needs of crayfish as omnivorous animals, which allows them to reproduce better and with a lower risk of disease. Natural feed has the potential to support the sustainability of the aquaculture sector.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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