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DIGITALIZATION OF MARICULTURE IN INDONESIA: A Review

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ABSTRACT

The transformation of the aquaculture industry in Indonesia continues to be encouraged to achieve a modern and efficient system. Mariculture is a cultivation activity carried out on marine species or commodities. However, several problems generally occur in these mariculture activities, such as monitoring water quality in real-time in floating net cages, cultivation media that still use traditional tools, and governance such as recording and sales that still rely on local fishery entrepreneurs. This of course needs to be given a touch of digitization to make it easier for aquaculture activities. Utilization of information technology through technological innovation to encourage increased productivity, the efficiency of aquaculture business, and increase product competitiveness through the application of the use of floating net cage (KJA) cultivation systems based on digital technology and various marketplaces in the fishery sector. The prospect of digitizing mariculture can provide various conveniences in the technical process of cultivation to marketing products from cultivation.

***Keywords*:**
Aquaculture, Digitization, Innovation, Mariculture, Technology

1. INTRODUCTION

Currently, the transformation of the aquaculture industry in Indonesia continues to be encouraged to achieve a modern and efficient system. This is mostly done in various ways, such as innovations in production systems that can simplify the direct production process as well as innovations in digital-based information to support better governance.

Maritime culture or commonly called mariculture is a term commonly used to describe aquaculture activities carried out on marine species or commodities. One example of mariculture activities is the cultivation of marine fish such as grouper (Epinephelus sp.) and other finfish, shellfish, crustaceans, or seaweed.

However, several problems generally occur in these mariculture activities, such as monitoring water quality in real-time in floating net cages, cultivation media that still use

traditional tools, and governance such as recording and sales that still rely on local fishery entrepreneurs. This of course needs to be given a touch of digitization to make it easier for aquaculture activities, especially cultivation activities carried out in-situ.

The writing of this journal intends to provide readers with an overview of the prospects for digitizing mariculture in Indonesia

2. DIGITALIZATION OF MARICULTURE

The challenge to the digital world is felt by all the people of the world, including Indonesia. Currently, society is faced with a situation of technological change and global competition. The transformation of aquaculture industrialization in Indonesia continues to be encouraged to achieve a modern and efficient system. By creating an innovative digital-based information system that functions to ensure the connectivity of the business system chain in the aquaculture industry. In Indonesia today, digital-based technology has not been carried out together.

In moving the spirit of transformation into the digital era, it is necessary to modernize the information system for aquaculture activities. The aim is to improve quality, accuracy, and time efficiency in every aquaculture business chain so that digitalization will become a modern bridge for all aquaculture stakeholders.

Some of the transformation factors towards digitalization in mariculture include;

- Encouraging increased efficiency and business competitiveness by focusing on superior commodities
- Optimizing the potential of the available land/area based on the carrying capacity of the environment
- Building a chain of production systems from upstream to downstream
- It is necessary to integrate activities and budgets between relevant stakeholders

Therefore, careful preparation is needed from all aspects to be able to apply digitization in mariculture activities.

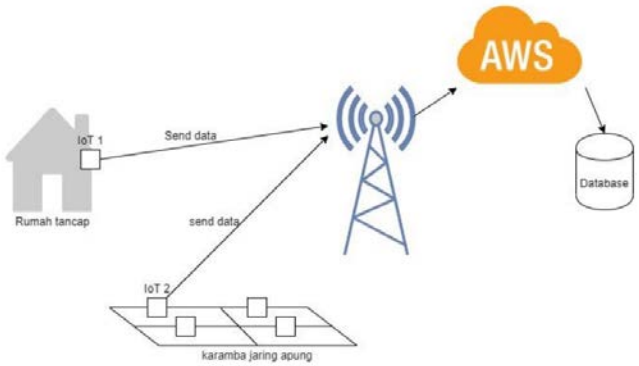
3. REAL-TIME ENVIRONMENTAL MONITORING INNOVATION

Fishermen already have tools to monitor the marine environment, but the data generated from these tools cannot be viewed in real-time and stored manually. Fishermen need to record air temperature and humidity, seawater temperature, and dissolved oxygen levels in seawater. Based on these problems, the internet of things (IoT) concept was developed (Uckelmann 2011) to monitor the condition of the marine environment. Monitoring is used to view information on marine environmental conditions that can be accessed online and in real-time so that fishermen can determine the right time to carry out fish maintenance and care activities in mariculture activities such as fish washing.

Data from the IoT system will be used to support the Thousand Islands Smart Fisherman (K1000) application so that fishermen can monitor the condition of the marine environment around their cages from the application. The measurement of dissolved oxygen levels is not done with real tools but uses a simulation of random values with limits on normal oxygen levels in seawater.

The protocol used for data transmission is message queuing telemetry transport (MQTT). One study using the MQTT protocol was conducted by Mulyono and Haviana

(2018) for monitoring temperature and humidity in the laboratory. Research conducted by Hermadi et al. (2021) aims to analyze the performance and security of the MQTT 3.5 protocol as a communication protocol on the IoT architecture and build an environmental monitoring system for grouper aquaculture.



The results of this research have succeeded in designing and building a marine environmental monitoring system with the internet of things (IoT) architecture. Starting from taking data from sensors to sending data into the database and displaying it in a graph. In addition, the overall security test of the network communication system by testing the private key and IoT Policy shows that IoT data communication using AWS services is guaranteed to be secure. The MQTT 3.5 protocol has an average protocol delay value which is in the very good category for all publishes with a delay of fewer than 0.015 seconds. The test results show that there is no packet loss and data duplication for all data sent. The overhead value obtained from the test results is quite large for the MQTT 3.5 protocol because it uses QoS 1 and is encrypted with the TLS 1 protocol.

4. SUNKING FLOATING NET CRAPS INNOVATION

The problem faced by cultivators to improve cultivation performance is a cultivation system that can support the growth and survival of commodities. The solution offered to partners to help solve current problems is in the form of submersible cage cultivation. The results showed that submersible cage cultivation can help aquaculture biota avoid surface-related problems such as the presence of predators, inappropriate temperatures, contaminants, and types of biofouling (Liu et al., 2019).

One of the problems faced in mariculture activities is the less than optimal performance of cultivation with floating net cage systems, allegedly due to high sea surface temperatures, especially during the dry season, as well as contaminants floating on the surface. In addition, the use of floating net cages is overgrown with biofouling organisms, thus inhibiting the circulation of water into the cages.

The solution to overcome the problem of water quality impacts, especially water temperature, and reduce the growth of biota attached to the net, it is better if the net cage is submerged at a certain depth. Thus, cultivation with a submersible cage floating net cage system is expected to improve cultivation performance in terms of growth performance and seed survival rate. The results showed that submersible cage fish farming can help aquaculture biota avoid surface-related problems such as the presence of predators, inappropriate temperatures, contaminants, and types of biofouling (Liu et al., 2019).

One example of a submersible floating net cage that has been developed belongs to PT. Aquatec. Aquatec HDPE Submersible Offshore Submersible Floating Net Cage (KJA) is specially designed for typhoon areas. Created with technology that makes the marine cage

able to be submerged to a depth of 10-20 meters below sea level and easy to float back to the water surface. The process of sinking and floating for many cages can be carried out simultaneously. This is the right solution for the need for a fast response when a typhoon comes. Timing in the process of sinking and floating cages is a vital key in maintaining fish in typhoon areas.

5. MARKETING OF FISH CULTIVATION PRODUCTS THROUGH ONLINE APPLICATIONS

Appropriate technology is a technology that is following the needs of the community, does not damage the environment, can be used and maintained by the community easily, and produces added value from economic and environmental aspects. Management and application of appropriate technology in the management of natural resources as an effort to optimize owned resources, promote the economy, strengthen citizen capabilities by encouraging the formation, development, and strengthening of entrepreneurship. Digital marketing or digital-based marketing is a marketing activity or activity with a series of ways and techniques that use digital media to increase sales. Digital marketing can be done by sharing media such as websites, blogs, YouTube, or using social media (Oktaviani & Rustandi, 2018).

Several strategies are given in digital marketing management, such as: determining what main media to choose. Before determining what media to choose, you should first determine the target market to be addressed. Determining the target market will affect the selection of the right social media. After determining the selected social media, then determine the personality. Determination of personality must be under the business owned. The language used in conveying information to buyers can be done in a relaxed language, lots of humor, some use formal and serious language. The most important thing in determining personality must be following the business you have. Personality in language selection is important for promotional tools, especially if we optimize the use of Instagram social media. Visuals and language that are pleasing and consistent can attract more buyers (Gumilar, 2015).

An example of digital innovation that has been carried out in the aquaculture industry is the creation of several start-ups in various fields of fisheries. This innovation acts as a hub for information networks and fisheries business. The technology aims to expand and strengthen as well as synergize the fishing industry network. Several start-ups in various fields have started running in Indonesia, such as Minapoli which is a fisheries marketplace. These efforts aim to make the aquaculture industry bigger and more efficient

6. CONCLUSIONS

Utilization of information technology through technological innovation to encourage increased productivity, the efficiency of aquaculture business, and increase product competitiveness through the application of the use of floating net cage (KJA) cultivation systems based on digital technology and various marketplaces in the fishery sector. Therefore, the prospect of digitizing mariculture can provide various conveniences in the technical process of cultivation to the marketing of products from these cultivations.

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