Fisheries Journal, 15 (4), 2024-2035 (2025)
http://doi.org/10.29303/jp.v15i4.1598

REVIEW: COMPARATIVE SYSTEM ANALYSIS OF OYSTER (*Crassostrea* sp.) BREEDING IN JAPAN AND INDONESIA

Review: Analisis Komparatif Sistem Pembesaran Tiram (*Crassostrea* sp) di Jepang dan Indonesia

Luthfi Naufal Ramadhan*, Junianto

Fisheries Study Program, Padjadjaran University

Bandung – Sumedang Highway Km. 21 Jatinangor 40132 Sumedang, West Java

*Corresponding Author: luthfi21004@mail.unpad.ac.id

(Received May 30th 2024; Accepted August 22th 2022)

ABSTRACT

Oysters (*Crassostrea sp.*) are high-value aquaculture commodities with significant economic and ecological potential. Japan and Indonesia are both maritime countries with vast marine resources, yet they differ considerably in their oyster farming systems. This study aims to conduct a comparative analysis of oyster cultivation systems in the two countries, focusing on farming methods, technology, environmental management, policy support, and productivity. A qualitative descriptive approach was employed through a literature review of various scientific sources and secondary data published over the past ten years. The results show that Japan has developed a modern and sustainable farming system, utilizing automation, real-time water quality monitoring, and strong, integrated policy support. In contrast, Indonesia still relies on traditional farming methods, with limited access to technology and weak environmental management, while policy implementation remains suboptimal. This comparison is essential as a foundation for evaluating and formulating strategic development plans for oyster aquaculture in Indonesia. A collaborative effort between the government, academics, and industry stakeholders is needed to strengthen the transition toward an efficient, adaptive, and sustainable oyster farming system in the future.

Key Words: Comparative, Indonesia, Japan, Oyster Farming

ABSTRAK

Tiram (*Crassostrea sp.*) merupakan komoditas perikanan bernilai ekonomi dan ekologis tinggi yang berpotensi besar untuk dikembangkan dalam sektor akuakultur. Jepang dan Indonesia merupakan negara dengan potensi perairan laut yang baik, namun memiliki perbedaan signifikan dalam penerapan sistem budidaya tiram. Penelitian ini bertujuan untuk menganalisis secara komparatif sistem pembesaran tiram di kedua negara berdasarkan aspek metode budidaya, teknologi, manajemen lingkungan, dukungan kebijakan, dan produktivitas. Penelitian dilakukan dengan pendekatan deskriptif kualitatif melalui studi literatur terhadap berbagai sumber ilmiah dan data sekunder dalam rentang 10 tahun terakhir. Hasil menunjukkan bahwa Jepang telah mengembangkan sistem budidaya yang modern dan berkelanjutan, dengan penggunaan teknologi otomatis, sistem monitoring kualitas air *real-time*, serta dukungan kebijakan yang kuat dan terintegrasi. Sebaliknya, Indonesia masih menerapkan sistem budidaya tradisional dengan keterbatasan teknologi dan manajemen lingkungan, serta implementasi kebijakan yang belum optimal. Perbandingan ini penting sebagai dasar evaluasi dan penyusunan strategi pengembangan budidaya tiram di Indonesia. Diperlukan sinergi antara pemerintah, akademisi, dan pelaku usaha untuk memperkuat sistem budidaya yang efisien, adaptif, dan berkelanjutan di masa depan.

Kata Kunci: Budidaya Tiram, Indonesia, Jepang, dan Komparatif

INTRODUCTION

Oysters (*Crassostrea sp*.) are a type of bivalve mollusk with high economic and ecological value (Umami et al. 2024). Economically, oysters have promising prospects because they can be a source of high-quality animal protein as well as a value-added export product, thus contributing significantly to fishermen's income and foreign exchange. In many countries, oyster cultivation is growing rapidly due to its significant potential as a source of animal protein and a high-value export product (Erlangga *et al*. 2022). Furthermore, oysters also function as natural biofilters that can help maintain seawater quality through their filtering activity. *Crassostrea sp*. is an efficient pollution bioindicator in predicting heavy metal pollution because it is a filter feeder and has a high tolerance to high ecological pressures (Munira *et al*. 2023). With increasing global awareness of the importance of consuming safe, healthy, and environmentally friendly seafood, as well as market pressure for sustainable aquaculture products, oysters have become a leading commodity in the aquaculture sector with significant potential for continued development in the future.

Globally, countries such as Japan, South Korea, and China have long developed intensive and integrated oyster cultivation technology (Poltak *et al*. 2023). Japan, as one of the most advanced countries in the fisheries sector, has a well-established oyster cultivation system with the application of modern technology, good environmental management, and strict product quality control (Ibrahim & Andriani 2022). The oyster rearing system in Japan has undergone a long-term process of innovation and adaptation, starting from the use of hatcheries for seeding, maintenance systems such as raft culture and longline systems, to the post-harvest stage that prioritizes food safety and product quality (Anwar & Maulina 2022). Furthermore, the Japanese government actively supports the development of the aquaculture sector through the provision of infrastructure, technical training, and research and innovation (Tunardjo *et al*. 2024). This makes Japanese oysters not only able to meet domestic consumption needs but also highly competitive in the export market.

In contrast, Indonesia, as a maritime nation with a long coastline and rich marine biodiversity, has not yet fully utilized its oyster cultivation potential (Ibrahim & Andriani 2022). Oyster cultivation is still limited and generally uses traditional methods that are not supported by adequate technology and management. Several coastal areas in Sumatra, Kalimantan, and Sulawesi have cultivated oysters, but productivity remains low and does not meet international market standards. Common problems include the availability of superior seeds, aquatic pollution, lack of technical assistance to farmers, and suboptimal regulations and trade systems. Yet, as an archipelagic nation with the second-longest coastline in the world, Indonesia possesses enormous marine resource potential for developing oyster cultivation nationally.

Therefore, a comparative analysis of oyster farming systems between Japan and Indonesia is crucial as a basis for evaluating and developing improved cultivation systems in

Indonesia. This research aims to examine the differences in oyster farming methods, technology, environmental management, and policy support between the two countries. By understanding the strengths and weaknesses of each system, it is hoped that strategic recommendations can be formulated for the development of efficient, sustainable, and highly competitive oyster farming in Indonesia.

RESEARCH METHODS

This study uses a qualitative descriptive approach with a literature study method (library research). Qualitative research is a research method that focuses on the analysis and understanding of observed social phenomena (Hardani et al. 2020). The literature study research technique is a series of scientific actions carried out by collecting several pieces of information relevant to the subject or problem to be studied (I Made & Cahyaningrum 2019). The researcher used a data collection method by reading literature on oyster (Crassostrea sp.) rearing systems in Japan and Indonesia. The data used is secondary data obtained from various reliable sources, such as scientific journal articles, research reports, government publications (e.g., from the Indonesian Ministry of Maritime Affairs and Fisheries), data from international organizations such as the FAO, textbooks, and online sources from relevant institutions over the past 10 years.

Data collection was conducted systematically using specific keywords, such as “oyster farming in Japan,” “oyster cultivation in Indonesia,” and “Crassostrea sp. rearing system,” to obtain comprehensive information related to cultivation methods, technologies used, environmental management, productivity, and supporting regulations in each country. After the data was collected, a descriptive and comparative analysis was conducted, namely by comparing the main indicators of the oyster rearing system in both countries, such as the type of rearing method (raft, longline, bottom culture), production efficiency, environmental management strategies, the role of the government, and challenges and opportunities in the development of cultivation.

RESULTS

To obtain a comprehensive overview of the differences in oyster farming systems between Japan and Indonesia, an analysis was conducted based on five main aspects: cultivation methods, technology, environmental management, policy support, and productivity. Each aspect was analyzed descriptively and compared using secondary data from various relevant scientific literature from the past 10 years. The results of this analysis are presented in tabular form to facilitate understanding and identification of significant differences between the two countries' oyster farming practices.

Aspect	Japan	Indonesia
Cultivation Methods	Using the long-line method and a hanging rack (raft system) in clean, deep-sea waters. Oyster cultivation in Japan utilizes rafts as a medium for seeding (spat collector), rearing, and harvesting, beginning in the 1920s (Hasegawa *et al*. 2015). The rafts used are made from a combination of bamboo, compost, wood, and Styrofoam tubes lined with	Conventional systems such as bottom culture and simple bamboo racks are still dominated. Oyster cultivation in Aceh Besar Regency uses bamboo arranged in blocks measuring 100 x 50 x 100 cm. The base of the rack is 50 cm from the bottom and consists of 7 bamboo poles (1 x 2 x 100 cm) with a distance of 6 cm between each

	replaceable polyethylene jackets. This is evident in the oyster cultivation rafts in Nagatsura-ura Lagoon, Sanriku Coast, Japan (Ibrahim & Andriani 2022). Treviño *et al*. (2020) added that oyster cultivation in Japan uses a hanging cultivation system on floating docks.	pole. The entire frame is tied securely with 2 mm PE rope. The containers used are PE plastic baskets measuring 40 x 30 x 10 cm tied to the racks using cable ties. Each basket is filled with 20 oyster spat measuring 2–3 cm (Maulana *et al*. 2025).
Technology	Automation is implemented in several stages, such as spat placement, real-time water quality monitoring, and the use of automated oyster washing and sorting equipment. This technology improves labor efficiency and yields. Sakamaki et al. (2025) and Tamura et al. (2024) state that there are several technologies for oyster farming, including: • Energy Dynamics Model (DEB Model) • POC (Particulate Organic Carbon) Budget Model • Hot Water Treatment (Hot Water Treatment) • Predictive Simulation for Cultivation Efficiency • Cultivation Rafts made of Polyethylene (PE) • PE Raft Modular Structure • OrcaFlex Numerical Model • Scale Model Test in Wave Tank	Most cultivation activities are carried out manually and traditionally without the support of water quality monitoring tools (Rosanawita *et al*. 2017).
Environmental Management	Environmental management is carried out systematically with strict monitoring of seawater quality, industrial waste disposal, and cultivation area rotation. Furthermore, there is an active biosecurity program to prevent the spread of disease. According to research by Kurniawan *et al*. (2023), Japan has very strict standards for water quality in Crassostrea sp. cultivation, including parameters such as temperature, salinity, dissolved oxygen, pH, and heavy metal content. Monitoring is carried out routinely using advanced	Environmental management remains weak, compounded by a lack of water quality data and limited coordination between stakeholders. This leaves them vulnerable to pollution and the spread of diseases such as oyster shell disease. According to research by Savitri (2019), water quality monitoring in *Crassostrea sp*. cultivation in Indonesia is generally limited and relies on manual methods. Monitored parameters typically include temperature, salinity, and pH. Waste management in *Crassostrea*

	technology. Waste from cultivation activities, including leftover feed and oyster feces, is properly managed to prevent water pollution. A waste recycling system is also implemented. Cultivation sites are carefully selected based on optimal environmental conditions, such as good water flow for water exchange and minimal sources of pollution. Japan tends to implement cultivation technologies that minimize negative impacts on the environment, such as water recirculation systems and the use of environmentally friendly materials.	*sp*. cultivation in Indonesia is not yet fully optimal. Waste is often discharged directly into the water without adequate treatment. The selection of *Crassostrea sp*. cultivation sites in Indonesia sometimes pays little attention to environmental aspects, potentially causing pollution and ecosystem damage. The application of environmentally friendly technologies in *Crassostrea sp*. cultivation in Indonesia is still limited. Most cultivators still use traditional methods that are inefficient and have the potential to pollute the environment.
Dukungan Kebijakan	The government provides subsidies, cultivation insurance, ongoing research, and regular technical training. There is strong synergy between government, industry, and academia. According to Ibrahim & Andriani (2022), Japan has mature and integrated policies and regulations for oyster cultivation, including Crassostrea sp. These policies cover technical aspects of cultivation, environmental management, waste control, and aquatic ecosystem protection. The Japanese government actively supports research and development of oyster cultivation technology, including seed production, cultivation layout, and strict water quality management, so that oyster cultivation can be carried out sustainably and efficiently. Strict regulations are also applied to the selection of cultivation sites that are appropriate to ecological conditions, as well as monitoring water quality and waste management to prevent damage to the aquatic environment. Furthermore, there is policy support for training and capacity building of cultivators to implement	Despite support from the Ministry of Maritime Affairs and Fisheries (KKP), policies are often poorly integrated, with limited training, and minimal incentives and applied research for local oyster farmers. Crassostrea sp. cultivation policies in Indonesia are still in the development stage, and implementation is not as stringent as in Japan. Regulations regarding cultivation site selection, environmental management, and waste control are not yet fully consistent and have not been fully implemented. The Indonesian government has issued several guidelines and technical standards for oyster cultivation, including environmental aspects such as water quality parameters and farm layout design, but implementation remains limited and dependent on local capacity. Policy support focuses more on increasing production and utilizing the vast natural potential, with efforts to adopt technology and management from developed countries such as Japan. However, challenges remain in terms of environmental monitoring and farmer training

	environmentally friendly and sustainable cultivation practices.	(Ibrahim & Andriani 2022). Farmer awareness and participation in the implementation of environmental policies need to be increased to ensure more sustainable oyster cultivation.
Productivity	Japan cultivates Crassostrea gigas (Pacific oysters) using advanced technology to support optimal growth and more consistent production. Japanese Pacific oysters are recognized as a premium product in both local and global markets for their high quality and productivity. Japan employs hanging-climbing methods and strict water quality management, as well as highly controlled cultivation site selection to maintain optimal conditions, such as temperature and salinity, for optimal oyster growth and production (Anwar & Maulina 2022).	Studies in Kupang waters show that *Crassostrea* cucullata oysters grow with an average shell length of around 7-8.5 mm per month and weigh around 21 grams per individual within 3 months of cultivation at an optimal density of 400 individuals/m². Survival rates are very high, reaching around 99% at this density (Kolo et al. 2020). Water quality conditions in Indonesia are quite favorable with temperatures of 30-33°C, pH 7.5-7.86, salinity 25-31 ppt, and currents of 0.21-0.27 m/s, but cultivation methods are still relatively traditional and dependent on natural conditions.

DISCUSSION

Cultivation Methods

Oyster cultivation in Japan has developed significantly since the early 20th century, with the application of continuously innovated technologies and methods. One of the main methods used is the long-line and raft system in clean, deep-sea waters with favorable currents. This cultivation system utilizes rafts as a medium for seeding (spat collector), rearing, and harvesting oysters. The rafts are designed from a combination of materials such as bamboo, compost, wood, and Styrofoam tubes lined with polyethylene jackets, which can be replaced as needed to increase durability and efficiency (Hasegawa *et al*. 2015). One concrete example can be seen in oyster cultivation in Nagatsura-ura Lagoon, Sanriku Coast, where the rafts used are 28 m long and 5.5 m wide (Ibrahim & Andriani 2022). Furthermore, according to Treviño *et al*. (2020), oyster cultivation in Japan also utilizes a hanging system on floating docks, which facilitates the monitoring and maintenance of oyster spat. This systematic approach allows for optimal oyster growth because they are not in direct contact with the seabed, thus avoiding mud, predators, and fluctuations in seabed conditions.

On the other hand, oyster cultivation methods in Indonesia are still dominated by simple and traditional conventional systems. One commonly used method is bottom culture, where oysters are cultivated directly on the seabed or using simple bamboo racks. Based on research by Maulana et al. (2025), oyster cultivation in Aceh Besar Regency uses a block-shaped bamboo rack structure measuring 100 x 50 x 100 cm, with the rack base placed approximately 50 cm from the seabed. The rack assembly consists of seven bamboo poles (1 x 2 x 100 cm) arranged with a distance of 6 cm between the poles and tied tightly with 2 mm PE rope. Oyster spat measuring 2–3 cm are then placed into PE plastic baskets measuring 40 x 30 x 10 cm, which are tied to the racks using cable ties. Each basket is filled with 20 oyster spat. Although this method is considered economical and easy to implement by local farmers, its limitations lie in maintenance efficiency and susceptibility to environmental disturbances such as bottom sediment and predators. In addition, this method is less flexible in managing stocking density and does not allow for intensive monitoring of oyster spat growth, which has the potential to reduce overall cultivation productivity.

Technology

Technological advancements are a key factor distinguishing oyster farming systems between Japan and Indonesia. Japan has integrated various forms of modern technology into almost every stage of oyster cultivation, from spat placement and maintenance to harvesting. One key technology implemented is the automation of the cultivation process, such as the use of tools for precise spat placement and automatic oyster washing and sorting machines, which not only speed up the work process but also reduce dependence on human labor (Sakamaki *et al*. 2025). Furthermore, real-time water quality monitoring systems allow farmers to continuously monitor critical parameters such as temperature, salinity, dissolved oxygen, and pH, effectively reducing potential environmental stress on oysters.

Some advanced technologies used by Japan in oyster cultivation include the Dynamic Energy Budget (DEB) Model, a mathematical model used to estimate oyster growth and energy requirements based on environmental conditions. This technology is very useful in designing optimal stocking densities and feeding strategies. The POC (Particulate Organic Carbon) Budget Model is used to understand the availability of organic matter in the water as a food source for oysters and helps predict cultivation productivity. Other technologies include Hot Water Treatment, a method of sterilizing oyster spat with hot water to eradicate pathogens or biofouling before the grow-out process. Furthermore, Japan also uses the PE Raft Modular Structure, a modular, easily reassembled polyethylene raft for cultivation, as well as the OrcaFlex Numerical Model, a hydrodynamic simulation software for designing and testing the resilience of cultivation structures to ocean currents and waves (Tamura *et al*. 2024). Scale model tests in wave tanks are conducted as part of laboratory simulations to verify the reliability of the raft system before its deployment in the open sea.

In contrast, conditions in Indonesia demonstrate a significant technological gap. Most oyster cultivation in Indonesia is still carried out manually and traditionally, without the support of modern tools for monitoring water quality or improving maintenance efficiency (Rosanawita *et al*. 2017). Local farmers still rely heavily on experience and conventional methods, which tend to lack precision and are not adaptive to environmental changes. The absence of monitoring technology slows down responses to changes in water parameters, which risks oyster growth and increases the likelihood of crop failure. These limitations not only impact production yields but also contribute to the low competitiveness of Indonesian oyster products in the global market. The limited use of technology also hinders the implementation of environmentally friendly, sustainable cultivation systems. Therefore, adopting technologies such as automated water quality monitoring systems, oyster cleaning equipment, or even simple predictive models could be the first step to increasing the efficiency and productivity of oyster cultivation in Indonesia.

Environmental Management

Environmental management is a crucial aspect of oyster cultivation because it directly relates to water quality, the health of the biota, and the sustainability of the cultivation business. In Japan, environmental management is carried out systematically and data-driven, with strict water quality monitoring using advanced technology. Environmental parameters such as temperature, salinity, pH, dissolved oxygen, and heavy metal content are regularly monitored to ensure ideal water conditions for oyster growth (Kurniawan et al. 2023). Furthermore, Japan implements a rotation system for cultivation areas, allowing the aquatic ecosystem to recover before reuse. An active biosecurity program is implemented to prevent the spread of disease and control populations of pest organisms. Cultivation waste, such as leftover feed and oyster feces, is not disposed of carelessly but is managed properly through a waste recycling system that minimizes pollution. Cultivation sites are selected based on in-depth analysis of oceanographic conditions, including ocean currents that support water exchange and a low risk of pollution from industrial or residential activities. Japan also consistently implements environmentally friendly cultivation technologies, such as the use of water recirculation systems and durable, environmentally friendly materials, such as polyethylene (PE) for cultivation rafts.

In contrast, environmental management in Indonesia still faces various structural and technical challenges. Water quality monitoring in Crassostrea sp. cultivation is still carried out manually and is limited, both in terms of the parameters measured and the frequency. According to Savitri (2019), monitoring typically only covers temperature, salinity, and pH, without measuring heavy metals, dissolved oxygen, or other important parameters. Limited equipment and human resources often result in unavailable or inaccurate water quality data. Furthermore, cultivation waste management is suboptimal, with leftover feed and oyster waste often being discharged directly into the water without treatment, which can degrade overall environmental quality. Cultivation sites are also often selected without adequate environmental studies, resulting in cultivation areas often located in areas with weak currents or near sources of pollution, which increases the risk of environmental stress and the spread of diseases such as oyster shell disease.

The lack of coordination between stakeholders, including the central government, regional governments, and fish farmers, is a major obstacle to implementing integrated environmental management. Furthermore, fish farmers' awareness of the importance of environmental sustainability remains low, as most focus solely on short-term production results. The adoption of environmentally friendly technologies is also limited due to limited funding, training, and access to information. If not addressed promptly, this situation has the potential to lead to ongoing degradation of aquatic ecosystems and reduce the productivity of oyster farming in the future.

Policy Support

Strong government policy support is a key factor in the success of oyster cultivation in Japan. The Japanese government has consistently demonstrated a strong commitment to the development of the oyster cultivation sector, including the Crassostrea sp. species, through various integrated and comprehensive policies. These policies cover technical aspects of cultivation, aquatic ecosystem protection, waste management, and environmental quality monitoring. One tangible form of support is the provision of cultivation subsidies and insurance, which can reduce economic risks for farmers. Furthermore, the government actively funds research and development of technologies that include superior seed production, innovative cultivation rafts, and water quality monitoring systems (Ibrahim & Andriani 2022).

Cross-sector collaboration between the government, the fisheries industry, and academia creates a mutually supportive innovation ecosystem and accelerates technology transfer to the field. The Japanese government also regularly conducts technical training for farmers to enable them to implement environmentally friendly and efficient farming practices. Strict regulations apply, particularly to the selection of cultivation sites, where areas must meet specific ecological standards to ensure the sustainability of aquatic resources. Waste management and water quality are also strictly monitored through legally binding mechanisms. This approach enables sustainable oyster farming in Japan, while producing high-quality products for both local and global markets.

On the other hand, policy support in Indonesia is still not optimally structured. Although the Ministry of Maritime Affairs and Fisheries (KKP) has focused on oyster cultivation development through various programs and technical guidelines, implementation in the field remains limited and often unintegrated across regions. According to Ibrahim, Indonesia's Crassostrea sp. cultivation policy is still in its development stage and is not as stringent as Japan's in terms of environmental monitoring, site selection, and waste management. Technical training for farmers is still rare, while applied research and incentives for adopting new technologies are also unevenly distributed.

Existing regulations, while covering important aspects such as water quality standards and farm layout design, have not been consistently implemented, and their success depends heavily on local capacity. Many farmers still lack access to the information or resources to implement these standards. Policy support in Indonesia also tends to focus more on increasing production volume and utilizing natural resource potential, without adequate oversight of sustainability aspects. This has led to low awareness and participation of farmers in implementing environmentally friendly practices, which ultimately hinders the development of highly competitive and sustainable oyster farming.

Productivity

Productivity is a key indicator in assessing the success of a cultivation system. In this regard, oyster cultivation productivity in Japan is significantly higher than in Indonesia. Japan cultivates the Crassostrea gigas, or Pacific oyster, using an approach based on modern technology and strict environmental controls. The use of hanging culture methods allows oysters to grow in water columns with optimal circulation, free from bottom sediments and predators. Cultivation sites are also carefully selected based on favorable oceanographic conditions such as stable temperatures, ideal salinity, and good water currents, all of which directly impact oyster growth and quality (Anwar & Maulina 2022). Pacific oysters from Japan are known as a premium product with high sales value in both local and international markets due to their uniform shell shape, distinctive flavor, and preserved nutritional content. The combination of strict water management, supporting technology, and site planning makes Japan one of the most productive and competitive oyster producers in the world.

Indonesia also has significant oyster cultivation potential, but it has not yet been fully utilized optimally. Studies conducted in Kupang waters show good growth, with an average shell length of around 7–8.5 mm per month and a weight of around 21 grams per individual within three months of cultivation at an optimal density of 400 individuals per square meter. The survival rate is also very high, reaching around 99%, indicating that the water quality in the area is very favorable, with temperatures between 30–33°C, pH 7.5–7.86, salinity 25–31 ppt, and currents of 0.21–0.27 m/s (Kolo et al. 2020). However, the cultivation system implemented in Indonesia still relies heavily on natural conditions and traditional methods such as the use of basic bamboo racks without sophisticated monitoring or control systems. This dependence makes oyster cultivation in Indonesia highly vulnerable to environmental changes and climate fluctuations, which ultimately impact production stability.

Technological limitations, lack of access to technical training, and minimal integration with scientific research are major obstacles to increasing productivity. Although the aquatic environment in several regions of Indonesia offers significant potential for oyster cultivation, the lack of a management- and technology-based approach has resulted in suboptimal production. This demonstrates the need for a transformation of traditional cultivation systems to modern, efficient, and sustainable systems, as implemented in Japan, to enable Indonesia to increase oyster productivity and competitiveness in both domestic and global markets.

CONCLUSION

Based on a comparative analysis of oyster cultivation between Japan and Indonesia, it can be concluded that Japan has a more advanced, integrated, and sustainable cultivation system than Indonesia. In terms of cultivation methods, Japan has long implemented efficient and environmentally friendly hanging rack and long-line systems, while Indonesia still relies on basic methods and simple bamboo racks that are less adaptable to environmental dynamics. In terms of technology, Japan excels in the use of automated devices, real-time water quality monitoring systems, and predictive models for production efficiency, while Indonesia still relies on manual methods without adequate technological support. In terms of environmental management, Japan implements data-driven management, strict supervision, and biosecurity and waste recycling systems. In contrast, Indonesia still suffers from weak environmental management, limited water monitoring, and suboptimal aquaculture waste management. Policy support in Japan is very strong and integrated. Conversely, in Indonesia, despite government support, implementation has not been optimal. Finally, in terms of productivity, Japan is able to consistently produce high-quality oysters thanks to sound technological and management approaches. Meanwhile, despite Indonesia's favorable water conditions, oyster productivity remains low due to traditional systems and suboptimal management.

This comparison is crucial as an evaluation tool and strategic reference for the future development of oyster cultivation in Indonesia. By learning from best practices implemented in Japan, Indonesia can begin to strengthen its technology, environmental management, and policy support. Collaborative efforts between the government, academics, and business actors are needed to transform the oyster cultivation system to be more modern, efficient, and sustainable.

ACKNOWLEDGEMENT

The author expresses his deepest gratitude to all parties who have provided support, assistance, and contributions in the preparation of this journal. In particular, the author expresses his appreciation to Prof. Dr. Ir. Junianto, MP, for his invaluable guidance, input, and direction. Without the support and cooperation of various parties, the preparation of this journal would not have proceeded smoothly. Hopefully, this journal will provide benefits and become a useful reference for readers.

REFERENCES

Anwar, F. R. D., & Maulina, I. (2022). Business Prospects For Cultivation Of Oyster (Crassostrea Gigas) In Okayama, Japan. *Jurnal Ilmu Perikanan Dan Sumberdaya Perairan*, *11*(1), 1179–1188.

Erlangga, E., Imanullah, I., Syahrial, S., Erniati, E., Imamshadiqin, I., Ritonga, G. H., & Siregar, D. F. (2022). Kondisi Eksisting Tiram (Bivalvia: Ostreidae) di Perairan Estuari Desa Banda Masen Kecamatan Banda Sakti Kota Lhokseumawe. *Buletin Oseanografi Marina*, 11(2), 156–166.

Hardani, Auliya, N. H., Andriani, H., Fardani, R. A., Ustiawaty, J., Utami, E. F., Sukmana, D. J., & Istiqomah, R. R. (2020). *Metode Penelitian Kualitatif & Kuantitatif*. Yogyakarta: Pustaka Ilmu.

Hasegawa, N., Onitsuka, T., Takeyama, S., & Maekawa, K. (2015). Oyster Culture in Hokkaido, Japan. National Research Institute of Aquaculture. *Bulletin of Fisheries Research Agency*. 40: 173 177.

I Made, I., & Cahyaningrum, I. (2019). Cara Mudah Memahami Metodologi Penelitian. Yogyakarta: Deepublish

Ibrahim, S., & Andriani, Y. (2022). Oyster Mussels (Crassostrea gigas) Transport System (Case Study In Kamashima Company) In Hyogo, Japan. *Marine Fisheries*, *13*(2), 291–31.

Kolo, S. N., Tjendanawangi, A. & Santoso, P. (2020). Perbandingan Pertumbuhan Dan Kelulushidupan Tiram (*Crassostrea Cucullata*) Yang Dipelihara Dengan Kolektor Dan Tanpa Kolektor Di Perairan Desa Tanah Merah, Kecamatan Kupang Tengah, Kabupaten Kupang. *Jurnal Aquatik,* 3 (1), 10-23

Kurniawan, E., Pramono, T. B., & Setyawan, A. C. (2023). Analisis Kelayakan Budidaya Kerang Hotate (Mizuhopecten Yessoensis) Di Teluk Funka, Hokkaido, Jepang. *Jurnal Ganec Swara*, *17*(3), 1078–1084.

Maulana, A., Syahputra, F., & Muhazzir, S. (2025). Efektivitas Metode Rak Dengan Desain Tata Letak Berbeda Pada Pembesaran Budidaya Tiram (Crassostrea Sp.) di Desa Neuheun Kecamatan Mesjid Raya Kabupaten Aceh Besar. *Jurnal MAHSEER*, *7*(1), 31–37.

Munira, M., Abidin, J., Kaimudin, I., & Ishak, N. (2023). Kepadatan Jenis Tiram Batu Di Tiang Dermaga Pantai Lamani Dan Pantai Kasten Desa Nusantara Kecamatan Banda. *MUNGGAI: Jurnal Ilmu Perikanan & Masyarakat Pesisir*, *9*(1), 47–55.

Poltak, H., Ahmad, I. G., Tartila, S. S. Q., Aonullah, A. A., AS, A. P., & Lumbessy, S. Y. (2023). *Teknologi Budidaya Perairan*. PT Global Eksekutif Teknologi: Padang

Rosanawita, R., Dewiyanti, I., & Octavina, C. (2017). Pengaruh Padat Penebaran Terhadap Pertumbuhan dan Kelangsungan Hidup Tiram (Crassostrea sp.). *Jurnal Ilmiah Mahasiswa Kelautan Dan Perikanan Unsyiah*, *2*(1), 213–220.

Sakamaki, T., Hatakeyama, Y., Saito, H., Fujibayashi, M., Hayashi, S., & Filgueira, R. (2025). Benefits from removing fouling mussels in suspension oyster aquaculture: An evaluation using farm-scale carbon budget and bivalve growth models. *Aquaculture*, *605*, 1-12.

Savitri, Y. D. (2019). *Analisis Logam Berat Timbal (Pb) pada Keseluruhan Organ Tiram Crassostrea cucullata di Pesisir Panciran, Kabupaten Lamongan, Jawa Timur*. [Skripsi]. Universitas Brawijaya.

Tamura, H., Iwamatsu, S., Iijima, K., & Nihei, Y. (2024). Motion characteristics and deformation performance of highly flexible polyethylene rafts for oyster farming. *Ocean Engineering*, *310*, 1-14.

Treviño, L., Lodeiros, C., Vélez-Falcones, J., Chávez-Alcivar, C., Isea-León, F., Bermúdez-Medranda, A. E., Vélez-Chica, J. C., Cruz-Quintana, Y., Leal, D., Santana-Piñeros, A. M., & Rodríguez-Pesantes, D. (2020). Suspended culture evaluation of Pacific oyster Crassostrea gigas in a tropical estuary. *Aquaculture Research*, *51*(5), 2052–2061.

Tunardjo, M. P., Elim, Y. V, N Lelan, S. M., Kause, W. L., T Nugraha, M. A., & Dj Umar, Z. (2024). Status Keberlanjutan Pengembangan Rumput Laut di Provinsi NTT. In *Seminar Nasional Politani Kupang Ke-7 Kupang*.

Umami, L., Karnan, K., & Santoso, D. (2024). Abundance and Distribution Patterns of Oysters (Saccostrea cucullata) in the Bagek Kembar Mangrove Area, West Lombok. *Jurnal Biologi Tropis*, *24*(3), 48–53.