Biotika, 6(61), December 2024, ISSN 2410-9290 (Online)
DOI https://doi.org/10.18551/biotika

UDC 639

IMPLEMENTATION OF GOOD AQUACULTURE PRACTICES' PRINCIPLES BY AQUACULTURISTS IN THE BANJAR REGENCY, SOUTH KALIMANTAN PROVINCE, INDONESIA

Hidayat Achmad Syamsu*, **Mustika Rina**, **Febrianty Irma**, **Agusliani Erma**, **Mailita**
Study Program of Fisheries Socioeconomics, Faculty of Fisheries and Marine Science,
University of Lambung Mangkurat, Banjarmasin, Indonesia
*E-mail: syamsu@ulm.ac.id

ABSTRACT
This study aims to analyze how aquaculture practices are based on the concept of Good Fish Cultivation Practices (CBIB) by freshwater aquaculturists in Banjar District, South Kalimantan, Indonesia. The study used an exploratory descriptive approach. The study was conducted in 3 sub-districts in Banjar District that are centers for freshwater pond fish farming. The study was conducted from June to December 2024. The respondents in this study were 101 aquaculturists taken purposively. The assessment of aquaculture practices was based on Annex IV of the Regulation of the National Standardization Agency of the Republic of Indonesia No. 4 of 2021 on the Conformity Assessment Scheme to Indonesian National Standards in section 4 of the Freshwater Fish CBIB Certification Scheme. Furthermore, the compliance of 17 indicators of aquaculture practices was assessed by categorizing them into 2 options, comply or not comply. Qualitative analysis refers to the concept of data triangulation. The discussion of aquaculture practices uses the approach of technical aspects, management aspects, food safety, and the environment. Study results show that the cultivation area is by the Banjar Regency RTRW with source water from the Karang Intan irrigation canal and Martapura River. Based on CBIP principles, there are 9 indicators of compliant farming practices (location, equipment, fishpond preparation, feed, water management, site and facility cleanliness, harvest and post-harvest, waste management and training) and 8 non-compliant indicators (source water, design, and layout, seed, stocking density, health management, environmental management, labor, and documentation).

KEY WORDS
Aquaculturists, fishponds, freshwater fish, CBIB principles.

Aquaculture fish is a major contributor to global food security, including in developing countries such as Indonesia. As one of the main providers of animal protein, fish has an important contribution to supplying people's nutritional needs. According to (FAO et al., 2022), the increasing global demand for fishery products has spurred the growth of the aquaculture sector, however, improper aquaculture practices can hurt human health and the environment (Ahmad et al., 2021; Venugopal & Sasidharan, 2021; Parlapani et al., 2023).

The implementation of Good Aquaculture Practice (CBIB) is crucial to ensure food safety and uphold resource sustainability. The implementation of aquaculture practices aimed at reducing the risk of contamination of aquaculture products is carried out through optimal environmental management, controlled feed quality, and the use of safe medicines (Munguti et al., 2020), thus, collaboration between the government, industry players, and the community is needed to ensure that all aspects of fish farming practices can run effectively and sustainably for the common welfare.

The implementation of CBIB not only ensures food safety but also increases the selling value of fishery products. Trade in the global market, especially in industrialized countries, is increasingly recognizing the importance of quality and safety standards in the products consumed. According to Bunting et al. (2023), aquaculture products that have gone through the CBIB process have a higher selling value in the international market than products that do not comply with standards (Kaimakoudi 2024). Market demand for GAP-certified fishery

products continues to increase as consumers seek safe and quality products (Fatima et al., 2023; Kaimakoudi, 2024). By applying CBIB standards, farmers can penetrate a wider export market and increase the competitiveness of local products in the international market.

The results of CBIB implementation also have a positive impact on the income of aquaculture farmers. According to (Aboua, 2023) the implementation of good aquaculture standards can increase production efficiency through reduced mortality and optimal use of resources. Study results (Kenconojati et al., 2023) and (Mulei et al., 2021) also show that the implementation of proper aquaculture practices can reduce long-term production costs through better fish health maintenance and reduced use of pharmaceuticals.

In Indonesia, the governance of aquaculture practices is delineated through the Decree of the Ministry of Marine Affairs and Fisheries Number 02 of 2007 on Good and Correct Fish Cultivation Practices (CBIB) and the Regulation of the National Certification Body of the Republic of Indonesia Number 4/2023. As per 2023 data, there are only six micro-scale Fish Farming Units that have obtained CBIB certification out of a total of 778 fish farming households using pond media in Banjar District, South Kalimantan Province, raising concerns regarding the quality and safety of fishery products derived from aquaculture activities in this region.

Banjar District is one of the districts in South Kalimantan Province that has a large and diverse potential for freshwater resources such as rivers, reservoirs, and tidal swamp waters. In 2023 Banjar District's freshwater fisheries yield was recorded at 1,509 tonnes consisting of species such as tilapia (*Oreochromis* spp.), catfish (*Pangasius* spp.), catfish (*Clarias gariepinus*), carp (*Cyprinus carpio* L.) and pomfret (*Pampus* spp.) reared in ponds, cages and floating net systems. Based on this condition, it is necessary to understand the practice of aquaculture in this area. This study aims to describe the practice of pond fish farming in Banjar Regency and analyze its compliance with the indicators of CBIB implementation for freshwater fish as stipulated by BSN Regulation No 4 Year 2023.

METHODS OF RESEARCH

This study uses an exploratory descriptive method, this method is considered capable of describing the situation or a phenomenon under study by what it is (natural) to systematically describe the facts and characteristics of the object under study precisely and understand each context of the phenomenon as a whole (Seixas et al., 2017); (Dzogovic & Bajrami, 2023).

The study location was determined purposively by considering that the location is a concentration area of fish farming practices using pond media along the banks of the Riam Kanan Irrigation, which is administratively located in the Karang Intan Sub-district, Martapura Sub-district, and Martapura Barat Sub-district of Banjar Regency. A total of 101 respondents were sampled in the study area, which is considered sufficient for analyzing the research data.

The qualitative analysis technique in this study refers to the concept of Miles and Huberman (Miles et al., 2014) which uses three interrelated stages of data analysis, namely after data are collected by interviews using questionnaires, data reduction is carried out based on the results of field verification, then data presentation and conclusion making. Data reduction is a process of selecting, focusing on simplifying and abstracting data that emerges from observations in the field as a form of verification. Data presentation is the preparation of the information that underlies the drawing of conclusions while concluding is in the form of recording the regularity of patterns that occur, explanations, real descriptions, causal flows, and propositions. These three activities of data analysis and collection are a cyclical and interactive process, carried out continuously, iteratively, and continuously as shown in Figure 2.

Biotika, 6(61), December 2024, ISSN 2410-9290 (Online)
DOI https://doi.org/10.18551/biotika

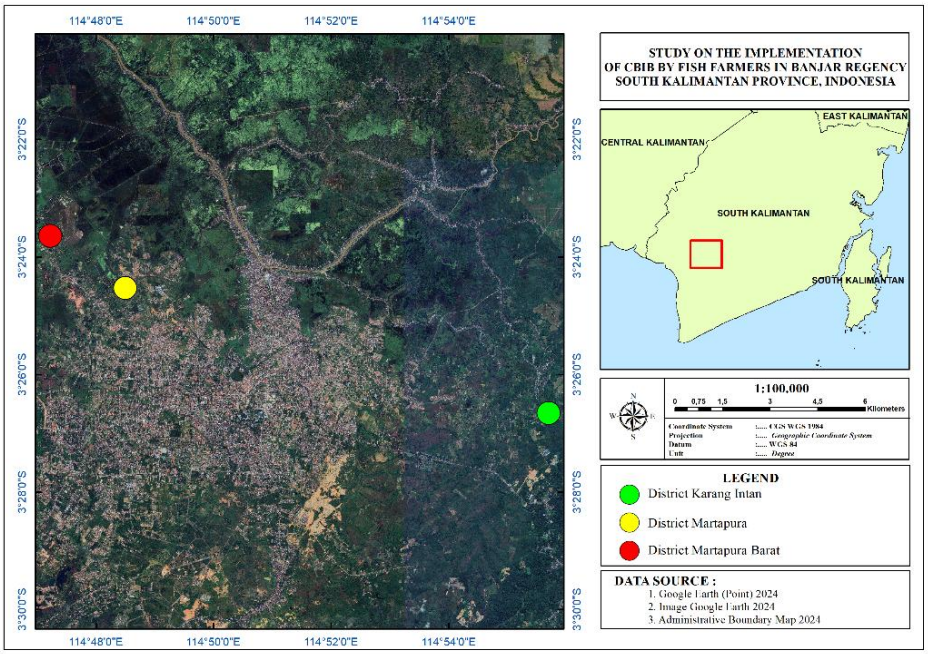

Figure 1 – Map of the research location

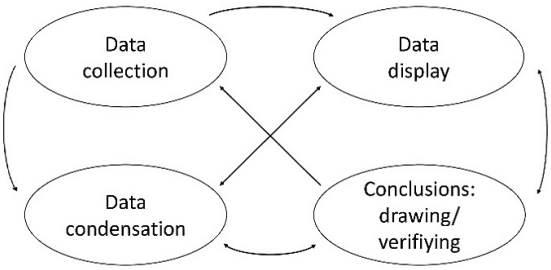

Figure 2 – Data Analysis Component: Interactive Model (Source: Miles et al., 2014, p. 14)

The parameters of aquaculture practices collected in this study include pond location, water source, pond design and layout, aquaculture equipment, preparation of aquaculture containers, seed, species selection and stocking density, feed, fish health management, water management, site and facility cleanliness, harvest and post-harvest, waste management, environmental management, workers, training, and documentation which refer to the parameters of Appendix IV of the Regulation of the National Standardization Agency of the Republic of Indonesia Number 4 of 2021 concerning Conformity Assessment Scheme to Indonesian National Standards for Agriculture, Plantation, Livestock and Fisheries Sector CBIB Certification Scheme part 4: Freshwater Fish. Furthermore, it is seen that compliance with the Appendix IV parameters is categorized into 2 options, namely existing conditions that comply or do not comply. The discussion of the application of aquaculture practices uses the approach of technical aspects, management aspects, food safety, and the environment. This study is also supported by secondary data obtained from various related agencies such as Village Profiles, Subdistricts in Figures, Fisheries Service Reports, and the Central Bureau of Statistics as well as other information from print media and the internet.

RESULTS AND DISCUSSION

Fish farming practices by aquaculturists in the study area have been verified based on BSN RI Regulation No. 4 of 2023 as a reference for the application of the CBIB concept, 9 indicators are appropriate or comply, and 8 indicators do not comply. Indicators that are complying and not in compliance based on the CBIB concept are presented in Table 1.

Table 1 – Indicators of CBIB Practice Implementation by aquaculturists

Indicator of CBIB		
Comply	-	Not Comply
Location	1	Source water
Equipment	2	Design and layout
Fishpond preparation	3	Seed
Feed	4	Selecting species and stocking density
Water management	5	Health management
Cleanliness of the location and	6	Environmental management
Harvest and post-harvest	7	Labor
Waste management	8	Documentation
Training	9	-

Source: Data processed, 2024.

The location of aquaculture in Martapura Sub-district, West Martapura Sub-district, and Karang Intan Sub-district is by BSN RI Regulation Number 4 Year 2023. The aquaculture areas are by the Regional Spatial Plan (RTRW)/Zoning as stated in Banjar Regency Regional Regulation Number 3 of 2013 concerning RTRW, where the three areas are included in the allotment area for freshwater aquaculture with pond media.

Preparation of fish farming containers is done by draining the bottom of the pond and filtering the water entering the container to avoid the entry of parasite hosts, pests, or predators. Lime, fertilizers, and chemicals are used according to the dosage and usage rules. The implementation of this practice, in addition to ensuring the safety of the surrounding ponds, can also minimize the occurrence of disturbances that hinder the smooth running of cultivation techniques such as pest problems, disturbances from irresponsible people, or the possibility of natural disasters (Kholish Mahyuddin, 2013).

Aquacultists have used feed according to the provisions of CBIB practices, which must be registered with the Ministry of KP. The feed brand has been registered in the KKP, for the registration number of the Comfeed feed brand, namely KKP RI IL 666082017, for the registration number of the Cargil feed brand, namely KKP RI INs 1564042018, for the registration number of the sinta feed brand, namely KKP RI IN 126102020. However, some use natural feed for 1 week at the beginning of cultivation activities. Feeding according to the needs and volume of fish, ranging from 600-700 sacks during the rearing period for stocking 10,000 fry. Feed storage has been placed in a safe storage area (warehouse) in the sense that the feed is not exposed to direct sunlight and is not exposed to rainwater.

The water source used comes from irrigation canals and rivers. The condition of the water is good enough for aquaculture activities because they use water storage ponds or simple filtration before being channeled to the cultivation ponds. The problem encountered for ponds sourced from irrigation is periodic draining to clean the irrigation channels. But this has usually been informed by the relevant agencies beforehand. Unfortunately, measurement of water quality parameters is not done periodically.

Aquaculture facilities and sites are kept clean by aquaculturists to avoid the occurrence of fish diseases. Equipment used such as hoes, nets, and basins are cleaned after use and if necessary disinfected to prevent the spread of diseases.

Harvesting is done by setting up a net to keep the fish on one side, then the pond water is reduced. After that, the collected fish are selected according to the size desired by the buyer and weighed according to the amount purchased, then put into plastic containers and ready to be sent to consumers. The harvesting equipment used includes nets, hapa, basins, and plastic. At harvest time, some farmers use ice, and others do not use ice depending on the location of the fish delivery. Ice is used so that when sent to the state of the fish is maintained freshness. The choice of time in harvesting fish is determined by the proximity of the marketing location, what is considered when harvesting fish is done in the morning or evening because the water temperature in the pond is low so that the fish are not easily stressed when harvesting.

A total of 62% of aquaculturists have received training on CBIB conducted by local fisheries extension officers. The training was mostly related to how to handle fish disease and changes in water quality.

Indicators of Non-Compliant Practices. Source water for pond fish farming in the study area comes from the Karang Intan irrigation canal and the Martapura River. Water availability meets the needs of the aquaculture business. The water quality based on the farmers' experience meets the requirements for fish farming whose end products are safe for consumption, but the aquaculturists have no records of water source management and no water source quality test results. Water quality management should be carried out continuously during operation to prevent infections caused by bacteria, viruses, and fungi (Grandiosa et al., 2020).

There are 4% of aquaculturists who have design documents for aquaculture containers and buildings that can support the production process. The fishponds and unit facilities used are in the vicinity of the aquaculturist's residence, which may cause contamination and/or cross-contamination, including the placement of sanitation facilities (toilets, septic tanks, wastewater, and drainage channels). Concerning pond design and layout, the location of freshwater fish farms should be close to water inlets and outlets so that water changes can be made at any time according to the needs of the aquaculture (Papadopoulos et al., 2023).

Fish seeds raised are tilapia and catfish seeds. The seeds used do not come from CPIB-certified hatchery units and/or have a certificate of healthy origin from an authorized agency or laboratory. Seeds are purchased from subscription seed traders without obtaining information on whether the seeds are certified. As the main means of production in aquaculture, fish seeds are very important and strategic in the hatchery process to the aquaculture production process because increasing aquaculture production must begin with the use of fish seeds that meet quality assurance (S. A. M. P. Suryani et al., 2022).

The species cultured were tilapia (Oreochromis niloticus) and catfish (Pangasius sp.). Before stocking, the fry is acclimatized by immersing the plastic bag containing the fry in pond water. After 45 minutes, the plastic bag was untied, and the pond water was allowed to enter little by little until all the seeds in the bag were released. The stocking density is 10,000 fish/400m2.

Fish health management is rarely done during the production process, except for fish that look sick. Handling is done by placing the fish in a special container, if it cannot be cured, the fish is destroyed by burning or burying (previously soaked with chlorine according to the recommended dose) and disinfection of the cultivation container is necessary.

Environmental management is not based on applicable regulations such as UKL/UPL. Monitoring activities are carried out incidentally and if environmental conditions are found that are considered disturbing, such as shrubs, they will be cleaned independently. One of the efforts to manage the environment is by implementing environmentally friendly freshwater fish farming. The fish farming in question is the process of enlarging fish to reach a large size. Freshwater fish farming is known as environmentally friendly fish farming that can produce fish optimally and sustainably (Kenconojati et al., 2023).

Laborers in aquaculture activities are business owners or family members. Pre-production activities such as preparation of aquaculture containers and production activities such as feeding are carried out by the owner assisted by family members, while post-production activities such as harvesting are carried out alternately with members of the aquaculture group (Pokdakan) or buyers bring their workers to help them harvest the fish purchased. Workers who help during harvest are paid Rp. 300-500/kg, with no allowances, social security, or other welfare facilities. Special health checks are never carried out by farmers because workers are generally considered healthy and strong. After all, the work in aquaculture activities requires a strong physique.

Aquqltutists in the study areas do not document (record) activities at the pre-production, production, harvest, and post-harvest stages in a regular and disciplined manner. The recording is done on sheets of paper or in the form of a collection of notes on the purchase of production materials (seeds, feed, medicines) so that the stages of implementation of aquaculture activities cannot be tracked. This also happens at harvest

time, when the number of fish harvested is only recorded on sheets of paper and not in a special notebook.

Discussion based on Aspects. Indicators on aquaculture practices with CBIB principles are discussed by most experts grouped into 4 aspects, namely technical, management, food safety, and environmental aspects (Rösler et al., 2021; Rohmah et al., 2023).

Technical aspects include location, facilities (feed warehouse and equipment), production process (seeds and broodstock), harvest and post-harvest; Management aspects include records of feed purchases, pond management, mortality data, feeding management, water quality checks; Food Safety aspects include: free of pharmaceuticals, use of feed and pharmaceuticals that are licensed by the ministry and Environmental Aspects include: water waste management and handling of dead fish.

Based on the technical aspects, almost all of them are complied with by aquaculturists in the study area, such as the location and storage facilities of equipment and feed, except for the use of seeds, none of them can show the certification of the origin of the seeds, only their acknowledgment that the seeds are purchased from a certified place. This certification will not only increase consumer confidence but also contribute to the sustainability of the fishing industry by ensuring that good aquaculture practices are consistently applied. It is important to increase aquaculturists awareness and understanding of the importance of seed certification so that the quality of aquaculture products can be guaranteed and meet the standards set by the relevant authorities (Saha, 2022; Sharma, 2020; Kambolong et al., 2023).

Records or documentation on feed purchase, pond management, mortality data, feeding, and water quality checks are classified as management aspects. All these practices are not practiced by the aquaculturists in the study area. This indicates that the awareness of aquaculturists on management aspects is lacking where they only pay attention to technical aspects so that their fish can stay alive and grow without taking into account the efficiency of input utilization factors (Goswami et al., 2020; Bhattacharya et al., 2020; Rahman et al., 2023; Cheruiyot & Adhiaya, 2023).

Regarding the low application of the CBIB principle to the aquaculture business they practiced, one of the aquaculturists said:

"We used to apply the CBIB principle until we had a certificate, but because there was no obligation to implement it and it did not affect the selling price or the requirements for marketing our products, we no longer do it".

The food safety aspect which includes the use of feed and medicines that have been licensed by the ministry has been applied by aquaculturists in the study area. However, based on the results of the interview, this application is not purely due to their awareness of the application of CBIB practices but there are other social factors, namely the dependence on investors who lend feed during the fish rearing period, the payment of which is made after the sale of the harvest to the investor. This kind of social system is common among aquaculturists throughout Indonesia (Athirah et al., 2020; Ismail et al., 2023; Ni'mah et al., 2023). This results in aquaculturists often being trapped in a cycle of debt that limits their ability to invest in better, more environmentally friendly farming practices. During interviews, several farmers stated:

"We get loans (feed) from investors without requiring collateral or guarantees, we only need to bring a collection of red notes (bond notes) for feed that we have used."

This system also creates uncertainty in resource management, where farmers must prioritize short-term profits to meet payment obligations to investors, sacrificing more sustainable and responsible practices (Vlachos & Malindretos, 2019; Ren et al., 2022). This social system also has the potential to hinder innovation and adoption of new technologies, as farmers are forced to focus on meeting financial obligations rather than exploring methods that can increase productivity and sustainability in the long term (E. Suryani et al., 2023).

The implementation of environmental aspects has mostly been carried out, especially for wastewater management and handling of dead fish, but no aquaculturists have Environmental Management Plan (RKL) and Environmental Monitoring Plan (RPL) documents as a reference for managing the cultivation environment. This shows the need for

intervention from the authorities to encourage farmers to develop comprehensive plans, to ensure that aquaculture practices not only prioritize financial profits but also consider environmental impacts and long-term sustainability (Abinaya. et al., 2019; JIN & BAI, 2020).

CONCLUSION

The application of the CBIB principle to freshwater pond aquaculturists in the study area has 9 appropriate indicators (location, equipment, container preparation, feed, water management, location and facility cleanliness, harvest and post-harvest, waste management, and training) and 8 inappropriate indicators (source water, design and layout, seeds, stocking density, health management, environmental management, workers and records). They generally apply technical aspects, food safety aspects, and environmental aspects but they do not apply the management aspect.

ACKNOWLEDGMENTS

The authors would like to thank the University of Lambung Mangkurat, which has funded this research from the source List of Budget Implementation for Fiscal Year 2024 Number: SP DIPA-023.17.2.677518/2024, dated 24 November 2023, under the Decree of the Rector of University of Lambung Mangkurat, Number: 1090.163/UN8.2/PG/2024, dated 3 June 3, 2024.

REFERENCES

1. Abinaya., M., Survenya., S., Shalini., R., Sharmila, P., & Baskaran, J. (2019). Design And Implementation of Aquaculture Monitoring And Controlling System. 2019 International Conference on Computation of Power, Energy, Information and Communication (ICCPEIC), 232–235. https://doi.org/10.1109/ICCPEIC45300.2019.9082359
2. Aboua, A. C. D. K. (2023). Resource Efficiency and Economic Efficiency of Fish Farms in the Southeast of Côte d'Ivoire. Asian Journal of Fisheries and Aquatic Research, 22(3), 26–40. https://doi.org/10.9734/ajfar/2023/v22i3572
3. Ahmad, A., Sheikh Abdullah, S. R., Hasan, H. A., Othman, A. R., & Ismail, N. 'Izzati. (2021). Aquaculture industry: Supply and demand, best practices, effluent, and its current issues and treatment technology. Journal of Environmental Management, 287, 112271. https://doi.org/10.1016/j.jenvman.2021.112271
4. Athirah, A., Mustafa, A., Ratnawati, E., Asaf, R., & Tarunamulia. (2020). Correlation between socio-demographic characteristics and adoption rate of good aquaculture practices in traditional technology-based fishpond in Pinrang Regency. IOP Conference Series: Earth and Environmental Science, 564(1), 012069. https://doi.org/10.1088/1755-1315/564/1/012069
5. Bhattacharya, M., Chini, D. S., Kar, A., Patra, B. C., Malick, R. C., & Kumar Das, B. (2020). Assessment and modeling of fish diversity related to water bodies of Bankura district, West Bengal, India, for sustainable management of culture practices. Environment, Development and Sustainability, 22(2), 971–984. https://doi.org/10.1007/s10668-018-0229-5
6. Bunting, S. W., Bostock, J., Leschen, W., & Little, D. C. (2023). Evaluating the potential of innovations across aquaculture product value chains for poverty alleviation in Bangladesh and India. Frontiers in Aquaculture, 2, 1111266. https://doi.org/10.3389/faquc.2023.1111266
7. Cheruiyot, J. K., & Adhiaya, M. (2023). Adoption of Aquaculture Technologies and Management Practices, Challenges and Productivity of Fish-Ponds in Kakamega County, Kenya. Asian Journal of Fisheries and Aquatic Research, 22(1), 25–36. https://doi.org/10.9734/ajfar/2023/v22i1563

8. Dzogovic, S., & Bajrami, V. (2023). Qualitative Research Methods In Science And Higher Education. Journal Human Research in Rehabilitation, 13, 156–166. https://doi.org/10.21554/hrr.042318
9. FAO, IFAD, UNICEF, WFP, & WHO. (2022). The State of Food Security and Nutrition in the World 2022. FAO ; IFAD ; UNICEF ; WFP ; WHO ; https://openknowledge.fao.org/handle/20.500.14283/cc0639en
10. Fatima, S., Ying, Z., & Sheer, A. (2023). Cross-sectional Study in China for the Management of Fish Production by the Evaluation of Socio-Demographic Aspects of Farmers and Best Practices Techniques for Fish Farming.
11. Goswami, P., Noman, R., Islam, M., & Huda, S. (2020). Use of Fish Farming Practices by the Fish Farmers. Research in Agriculture Livestock and Fisheries, 7, 565–576. https://doi.org/10.3329/ralf.v7i3.51375
12. Grandiosa, R., Sugandhy, R., & Nugraha, A. (2020). Sikap Pembudidaya Dalam Penyuluhan Kualitas Air Untuk Budidaya Ikan Di Desa Kertayasa, Kecamatan Cijulang, Kabupaten Pangandaran. Farmers : Journal of Community Services, 1(1), 12–18. https://doi.org/10.24198/fjcs.v1i1.28863
13. Ismail, K., Setiawan, T., Lestari, F., & Habibah, S. N. (2023). The Food Accessibility of Fishermen's Households in Small and Outermost Islands with Social Network Analysis. Journal of Marine and Island Cultures, 12(1). https://doi.org/10.21463/jmic.2023.12.1.08
14. JIN, C., & BAI, Q. (2020). The Monitoring System of Aquaculture Environment. 2020 13th International Symposium on Computational Intelligence and Design (ISCID), 184–187. https://doi.org/10.1109/ISCID51228.2020.00048
15. Kaimakoudi, E. (2024). Policy initiatives towards enhancing consumer knowledge and tackling consumer confusion in aquaculture sector. Aquaculture International, 32(1), 1–9. https://doi.org/10.1007/s10499-023-01143-2
16. Kambolong, M., Sahrun, Ningtyas, C. P., Makmur, M., & Darwis, N. (2023). Analisis Pengembangan Usaha Benih Ikan Air Tawar Dalam Meningkatkan Pendapatan. Journal Publicuho, 6(1), 92–105. https://doi.org/10.35817/publicuho.v6i1.74
17. Kenconojati, H., Ulkhaq, M. F., Suciyono, Ambarwati, D., Bahtiar, S. A., Wahyudi, E., Anggraeni, S. F., & Ristin, L. M. (2023). Increasing Productivity Of Fish Farmers Through Fish Health And Environmental Management Training In Genteng District, Banyuwangi. Jurnal Layanan Masyarakat (Journal of Public Services), 7(1), 131–139. https://doi.org/10.20473/jlm.v7i1.2023.131-139
18. Kholish Mahyuddin, S. Pi. M. (2013). Panduan Lengkap Agribisnis Patin. Penebar Swadaya Grup.
19. Miles, M. B., Huberman, A. M., & Saldana, J. (2014). Qualitative Data Analysis. SAGE.
20. Mulei, I. R., Mbuthia, P. G., Waruiru, R. M., Nyaga, P. N., Mutoloki, S., & Evensen, Ø. (2021). Management Practices, Farmers' Knowledge of Diseased Fish, and Their Occurrence in Fish Farms in Nyeri County, Kenya. Veterinary Medicine International, 2021, 8896604. https://doi.org/10.1155/2021/8896604.
21. Munguti, J. M., Kirimi, J. G., Obiero, K. O., Ogello, E. O., Kyule, D. N., Liti, D. M., & Musalia, L. M. (2020). Aqua-Feed Wastes: Impact on Natural Systems and Practical Mitigations—A Review. Journal of Agricultural Science, 13(1), Article 1. https://doi.org/10.5539/jas.v13n1p111.
22. Ni'mah, L. U., Sumekar, W., & Legowo, A. M. (2023). Analysis of factors affecting food security of fisherman's household in Tayu district, Pati Regency. AIP Conference Proceedings, 2586(1), 070010. https://doi.org/10.1063/5.0106741.
23. Papadopoulos, P., Buchanan, W. J., Sayeed, S., & Pitropakis, N. (2023). Towards the creation of the future fish farm. Journal of Surveillance, Security, and Safety, 4(1), 1–13. https://doi.org/10.20517/jsss.2022.16.
24. Parlapani, F. F., Boziaris, I. S., & Mireles DeWitt, C. A. (2023). Chapter 32—Pathogens and their sources in freshwater fish, sea finfish, shellfish, and algae. In M. E. Knowles, L. E. Anelich, A. R. Boobis, & B. Popping (Eds.), Present Knowledge in Food Safety (pp. 471–492). Academic Press. https://doi.org/10.1016/B978-0-12-819470-6.00056-1.

25. Rahman, M. S., Kazal, M. M. H., Rayhan, S. J., & Manjira, S. (2023). Adoption determinants of improved management practices and productivity in pond polyculture of carp in Bangladesh. Aquaculture and Fisheries, 8(1), 96–101. https://doi.org/10.1016/j.aaf.2021.08.009.
26. Ren, Z., Chen, H. H., Lao, K., & Zhang, H. (2022). A Decision Support System to Estimate Green Sustainability from Environmental Protection and Debt Financing Indicators. Agriculture, 12(8), Article 8. https://doi.org/10.3390/agriculture12081249.
27. Rohmah, M., Fadhila, S., Rahmadi, A., & Andriyani, Y. (2023). Application of Good Processed Food Production Method (CPPOB) for BPOM distribution license certification. Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang, 8(2), 366–377. https://doi.org/10.26905/abdimas.v8i2.10490.
28. Rösler, F., Kreyenschmidt, J., & Ritter, G. (2021). Recommendation of Good Practice in the Food-Processing Industry for Preventing and Handling Food Loss and Waste. Sustainability, 13(17), Article 17. https://doi.org/10.3390/su13179569.
29. Saha, C. K. (2022). Emergence and evolution of aquaculture sustainability certification schemes. Marine Policy, 143, 105196. https://doi.org/10.1016/j.marpol.2022.105196.
30. Seixas, B. V., Smith, N., & Mitton, C. (2017). The Qualitative Descriptive Approach in International Comparative Studies: Using Online Qualitative Surveys. International Journal of Health Policy and Management, 7(9), 778–781. https://doi.org/10.15171/ijhpm.2017.142.
31. Sharma, M. (2020). Special issue on Fisheries-Journal of Krishi Vigyan. Special Issue on Fisheries-Journal of Krishi Vigyan. https://www.academia.edu/45396327/Special_issue_on_Fisheries_Journal_of_Krishi_Vigyan.
32. Suryani, E., Hendrawan, R. A., Mudjahidin, M., Damanhuri, D., Muhandhis, I., Az-Zahra, A., Yan-Chou, S., Rony, M., & Masyhudi, A. J. (2023). Agriculture System Modeling to Increase Productivity and Production Through Sustainable Resource Management. Journal of Agricultural Science, 15(2), Article 2. https://doi.org/10.5539/jas.v15n2p10.
33. Suryani, S. A. M. P., Abdulah, F., Faudzi, N., Sadguna, D. N., Arya, I., Edi, D. G. S., & Pratama, G. A. (2022). Improving the Quality of Tilapia Fish Seeds (Oreochromis Niloticus) with Selection Methods in Mina Ayu Group of Tabanan Regency Bali Province. AJARCDE | Asian Journal of Applied Research for Community Development and Empowerment, 6, 34–39. https://doi.org/10.29165/ajarcde.v6i1.69.
34. Venugopal, V., & Sasidharan, A. (2021). Seafood industry effluents: Environmental hazards, treatment,F and resource recovery. Journal of Environmental Chemical Engineering, 9(2), 104758. https://doi.org/10.1016/j.jece.2020.104758.
35. Vlachos, I., & Malindretos, G. (2019). Managing Uncertainty Through Sustainable Re-engineering of the Value Chain. An Action-Research Study of the Aquaculture Industry. In X. Liu (Ed.), Environmental Sustainability in Asian Logistics and Supply Chains (pp. 153–167). Springer. https://doi.org/10.1007/978-981-13-0451-4_9.