Fisheries Journal, 15 (4), 2048-2054 (2025)
http://doi.org/10.29303/jp.v15i4.1630

ANALYSIS THE INCREASING OF VANAME SHRIMP PRODUCTIVITY THROUGH SIMORIKA IN SUKADANA VILLAGE, NORTH LOMBOK

Analisis Peningkatan Produktifitas Udang Vaname Melalui SIMORIKA di Desa Sukadana Lombok Utara

Handri Jurya Parmi*, Muslihuddin Aini

Gunung Rinjani University

Jl. Raya Mataram - Labuhan Lombok Desa No.KM 50, Kabupaten Lombok Timur, Nusa Tenggara Barat 83652

*Coresponding author: handrijp89@gmail.com

(Received June 13th 2025; Accepted August 22th 2025)

ABSTRACT

This study aims to analyze the effect of the implementation of the Water Quality Monitoring and Control System (SIMORIKA) on increasing the productivity of Vaname shrimp cultivation in Sukadana Village, North Lombok Regency. SIMORIKA is a technology-based innovation that allows farmers to monitor water quality in real-time, so that cultivation decisions can be made quickly and accurately. The research method used is a quantitative approach with a pre-experimental design using a one-group pretest-posttest model. The results showed that after the implementation of SIMORIKA, there was a significant increase in Vaname shrimp productivity, as measured by the survival rate (SR), harvest weight, and feed efficiency. These findings indicate that monitoring technology such as SIMORIKA has great potential in supporting the sustainability and efficiency of the aquaculture sector.

Keywords: Cultivation, Productivity, SIMORIKA, Vaname Shrimp, Water Quality

ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh penerapan Sistem Monitoring dan Kontrol Kualitas Air (SIMORIKA) terhadap peningkatan produktivitas budidaya udang Vaname di Desa Sukadana, Kabupaten Lombok Utara. SIMORIKA merupakan inovasi berbasis teknologi yang memungkinkan petambak melakukan pemantauan kualitas air secara real-time, sehingga keputusan budidaya dapat dilakukan secara cepat dan tepat. Metode penelitian yang digunakan adalah pendekatan kuantitatif dengan desain pra-eksperimen menggunakan model one-group pretest-posttest. Hasil penelitian menunjukkan bahwa setelah penerapan SIMORIKA, terjadi peningkatan signifikan pada produktivitas udang Vaname, yang diukur dari tingkat kelangsungan hidup (SR), bobot panen, dan efisiensi pakan. Temuan ini menunjukkan bahwa teknologi monitoring seperti SIMORIKA memiliki potensi besar dalam mendukung keberlanjutan dan efisiensi sektor perikanan budidaya.

Kata Kunci: Udang Vaname, SIMORIKA, Produktivitas, Budidaya, Kualitas Air

INTRODUCTION

Whiteleg shrimp (*Litopenaeus vannamei*) is Indonesia's leading export commodity, contributing more than 60% of the total value of aquaculture exports (KKP, 2023). Over the past five years, national whiteleg shrimp production has shown a significant upward trend, from 475,000 tons in 2018 to over 700,000 tons in 2022. Lombok, as part of West Nusa Tenggara (NTB) Province, is known to have significant potential for developing whiteleg shrimp cultivation, including in North Lombok Regency. One of the centers of whiteleg shrimp production and productivity is Sukadana Village (Latifah et al., 2025).

However, shrimp pond productivity in this area remains suboptimal. Farmers frequently face major challenges such as drastic changes in water quality, high shrimp mortality rates, and inefficient feed use (Aras & Faruq, 2024). Statistical data from the North Lombok Maritime Affairs and Fisheries Service in 2022 shows that the average survival rate (SR) of shrimp in traditional ponds is still below 70%, while the feed conversion ratio (FCR) is in the range of 1.8–2.1, indicating low feed efficiency (Indra Gunawan et al., 2022).

To address these issues, Internet of Things (IoT)-based water quality monitoring technology has been introduced, one of which is SIMORIKA (Water Quality Monitoring and Control System) (Jamal et al., 2021). This technology allows real-time monitoring of critical parameters such as temperature, salinity, pH, and dissolved oxygen through sensors connected to digital devices. With accurate and up-to-date information, farmers can respond quickly and appropriately to changing environmental conditions, minimizing potential losses (Hendiari et al., 2020).

Various studies have demonstrated the effectiveness of digital technology in improving shrimp farming efficiency. Sari et al. (2023) found that the use of an IoT-based monitoring system in shrimp ponds reduced FCR by up to 20% and increased SR by up to 15%. A similar study by Fangohoi et al. (2023) confirmed that stable water parameters are crucial for successful shrimp farming, as extreme changes in temperature or oxygen levels can cause stress and mass mortality in shrimp.

On the other hand, Kurniawan et al. (2022) stated that implementing a digital monitoring system such as SIMORIKA not only increases productivity but also reduces the manual workload for farmers, thereby increasing labor efficiency. However, studies on SIMORIKA implementation at the village level, particularly in North Lombok, are still very limited, so further research is needed to empirically determine its impact (Made et al., 2024).

The objectives of this study were to analyze the impact of SIMORIKA implementation on the productivity of whiteleg shrimp farming in Sukadana Village. 2) To assess changes in productivity parameters such as survival rate (SR), harvest weight, and feed efficiency before and after SIMORIKA implementation. 3) Provide recommendations for the development of IoT-based monitoring technology in sustainable fisheries cultivation.

METHODS

This research was conducted in Sukadana Village, Bayan District, North Lombok Regency, a coastal area with significant potential for whiteleg shrimp cultivation. The location was selected purposively because the village has implemented a technology-based water quality monitoring system, SIMORIKA. The research lasted for one shrimp cultivation cycle, 90 days, from February to May 2025.

The tools and materials used in this study included the SIMORIKA device, which consists of a water quality sensor, a control module, and an internet-based monitoring application. In addition, supporting equipment such as a digital thermometer, a DO meter to measure dissolved oxygen levels, a pH meter, and a refractometer to measure water salinity were also used. Documentation tools such as a camera, a laptop, and observation forms were also used to support field data recording. The main materials used in this cultivation activity were whiteleg shrimp fry, commercial feed, and supporting materials such as probiotics, molasses, and pond lime.

The research design used was a pre-experimental one-group pretest-posttest design. The One-Group Pretest-Posttest Design is a type of pre-experimental research design that uses only one group of subjects without a control group (Hastjarjo, 2019). In this design, researchers observe the same group of shrimp farmers before and after implementing the SIMORIKA system, without using a control group. Data collection was conducted in two stages: before (pretest) and after (posttest) the monitoring system. In the pretest stage, researchers collected data related to shrimp productivity, such as survival rate (SR), average harvest weight, and feed conversion ratio (FCR), using manual records typically maintained by farmers.

Survival Rate (SR) is the percentage of organisms still alive at the end of the culture period compared to the initial number at stocking (Tahapari & Suhenda, 2009). The following formula was used:

$$SR = \frac{Nt}{No} \times 100\%$$

Where:
SR : Survival (%);
Nt : Number harvested;
No : Number stocked.

The Feed Conversion Ratio (FCR) indicates the efficiency of feed use in producing weight gain in cultivated organisms (Febrian et al., 2025). The lower the FCR, the more efficient the feed use. The following formula is used:

$$FCR = \frac{F}{(Wt + D) - Wo}$$

Where:
FCR : Feed Conversion Ratio;
Wo : Initial weight (kg);
W : Final weight (kg);
D : Dead shrimp weight (kg);
F : Amount of feed consumed (kg).

Afterward, the SIMORIKA system was installed and actively used for one cultivation cycle. Farmers were also trained to understand the SIMORIKA data and use it in pond management decisions. After 90 days, productivity data was measured again using the same parameters to analyze differences.

The obtained data were analyzed quantitatively using descriptive and inferential statistical approaches. Descriptive statistics were used to describe the average, minimum, maximum, and standard deviation values of each observed parameter. Furthermore, to determine whether there were significant differences before and after SIMORIKA implementation, a paired sample t-test was used. This test aimed to determine the effect of the monitoring system on whiteleg shrimp productivity, with a significance level set at $p < 0.05$. Data analysis was performed using statistical software such as SPSS.

RESULTS

The results of this study are as follows:

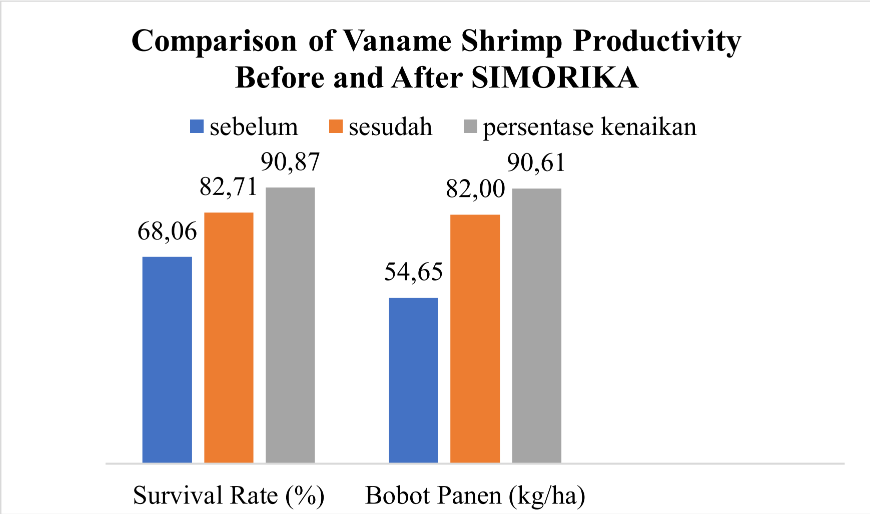

Figure 1. Comparison Graph of Productivity Before and After SIMORIKA Implementation

Table 1. Comparison of Whiteleg Shrimp Productivity Before and After SIMORIKA Implementation in 2025

Parameter	Before SIMORIKA	After SIMORIKA	Unit
Survival Rate (SR)	68	82	%
Harvest Weight	520	685	kg/hectare
Feed Conversion Ratio	1.9	1.4	ratio

Source: Primary Data (2025)

Table 2. Water Quality Parameters During Whiteleg Shrimp Cultivation in 2025

Week	Temperature (°C)	pH	DO (mg/L)	Salinity (ppt)
M1	29.1	7.8	5.9	25
M2	29.3	7.9	6.0	26
M3	29.5	8.0	6.2	26
M4	29.4	8.0	6.1	27
M5	29.2	8.1	6.3	28
M6	29.3	8.0	6.2	28
M7	29.4	7.9	6.4	28
M8	29.5	7.9	6.3	27
M9	29.3	8.0	6.5	27
M10	29.4	8.1	6.4	26
M11	29.2	8.0	6.3	26
M12	29.3	8.0	6.2	25

Source: Primary Data (2025)

DISCUSSION

The analysis results showed a significant increase in all productivity parameters. The survival rate increased from 68.06 before SIMORIKA to 82.71 after. The average rate increased to 90.87%, indicating that the monitoring system helps maintain stable water conditions, thereby reducing shrimp mortality (Fatwasauri et al., 2025). Similarly, harvest weight increased by 54.65%, from 520 kg/ha to 685 kg/ha, or 82%, indicating that data-driven management has resulted in optimal shrimp growth (Rizky Aprilia et al., 2023).

Meanwhile, the research results in Table 1, comparing the increase in whiteleg shrimp productivity before and after SIMORIKA, show the most striking decrease in the Feed Conversion Ratio (FCR) from 1.9 to 1.4 (Tobing & Widjaja, 2024). This means that feed use is more efficient because feeding can be adjusted precisely based on environmental conditions, which are monitored in real time by SIMORIKA. A low FCR indicates high efficiency, which of course has a direct impact on farmer profits (Safrizal et al., 2025). Overall, these results support the hypothesis that SIMORIKA positively influences the productivity of whiteleg shrimp cultivation. This aligns with the findings of Sari et al. (2023), who stated that the application of IoT-based technology in shrimp cultivation can reduce FCR by up to 20% and increase SR by more than 10%.

Meanwhile, after implementing the SIMORIKA system for one cultivation cycle (90 days), a comparison of conditions before and after the technology implementation was obtained for three main productivity indicators: Survival Rate (SR), harvest weight per hectare, and feed conversion ratio (FCR) (Table 1). Furthermore, the results of parameter analysis for 12 weeks (one cultivation cycle) showed that the SIMORIKA system periodically recorded water quality parameter data, including temperature, pH, dissolved oxygen (DO), and salinity (Mirza et al., 2022). The graph above shows the stability trend of each parameter, which is an important factor in supporting the growth and survival of Vaname shrimp (Haryanti et al., 2024).

The average water temperature during cultivation ranged from 29.1°C to 29.5°C, within the optimal range for shrimp growth, which is 28–32°C (SNI 01-7246.4-2006). The pH value remained stable between 7.8 and 8.1, indicating that the water conditions were relatively neutral and safe for shrimp (Pauzi et al., 2020). Dissolved oxygen (DO) showed an increasing trend from the first week (5.9 mg/L) to 6.5 mg/L in week 9, remaining within the safe range (>5 mg/L). Salinity was also stable between 25–28 ppt, in line with the tolerance of whiteleg shrimp (20–30 ppt) (Zainuddin et al., 2015).

The stability of these parameters demonstrates SIMORIKA's effectiveness in helping farmers monitor and maintain the cultivation environment within optimal limits. This supports the productivity increases demonstrated in the previous section. Real-time monitoring allows for rapid action when conditions change, such as adjusting aeration, feeding, or applying pH and salinity-balancing chemicals. Thus, the data recorded by SIMORIKA provides not only informative benefits but also serves as a basis for evidence-based decision-making in pond management. Consistency of water quality parameters is key to achieving sustainable high productivity.

CONCLUSION

Based on the results of research on the application of SIMORIKA in Vaname shrimp cultivation in Sukadana Village, North Lombok, it can be concluded that the use of this technology-based monitoring system has a significant positive impact on increasing pond productivity. SIMORIKA has been proven to help farmers monitor pond environmental conditions in real-time, such as water quality (pH, temperature, dissolved oxygen, and salinity), and facilitate decision-making in cultivation management. Increased productivity is seen from several indicators, namely an increase in the average weight of shrimp, increased harvest yields, and improved shrimp survival rates. In addition, this system also helps in disease prevention through early detection and more responsive pond management. Thus, SIMORIKA is an innovative, relevant and applicable solution to address the challenges of Vaname shrimp cultivation in coastal areas, especially in Sukadana Village. For future development, the use of

SIMORIKA needs to be continuously encouraged, accompanied by training and mentoring so that all farmers are able to operate this technology independently and optimally.

ACKNOWLEDGEMENT

The researchers would like to express their deepest gratitude to the North Lombok Regency Maritime Affairs and Fisheries Service for the support, permits, and facilities provided during the research process. They also express their gratitude to the Sukadana Village Government for providing access and assistance in carrying out field activities. Special appreciation is extended to the shrimp farmers in Sukadana Village who were willing to take the time, share information, and provide access to their cultivation activities, ensuring the successful collection of data needed for this research. The cooperation and openness of all parties was crucial to the smooth running and success of this research.

REFERENCES

Aprilia, R., Ramadhan, D. N., & Irawati, I. D. (2023). Sistem monitoring kualitas air pada tambak udang vaname di Kecamatan Kalitengah berbasis Internet of Things. *E-Proceeding of Applied Science, 9*(1), 306–315.

Aras, A. K., & Faruq, W. E. M. (2024). Penerapan Budidaya Udang Vaname Dengan Sistem Super Intensif (StudiKasus: Pt Xyz, Karangasem, Bali). *Jurnal Ilmu Perikanan Dan Kelautan Indonesia*, *6*(1), 60–75.

Fangohoi, L., Makabori, Y. Y., & Ataribaba, Y. (2023). Factors That Determine Farmer Participation Rate In The Farmer Group. *Jurnal Penelitian Pertanian Terapan*, *23*(1), 1–12. https://doi.org/10.25181/jppt.v23i1.2288

Fatwasauri, I., Fitriyanto, I., Maknunah, J., Pahlevi, R., & Fazri, D. M. (2025). *Implementasi Sistem Aerator Menggunakan Kincir Berbasis Panel Surya pada Empang Udang*. *5*(2), 455–462. https://doi.org/10.30812/adma.v5i2.4534

Febrian, M. R., Surianti, S., & Damis, D. (2025). the Effect of Substitution of Suckermought Catfish Flour With Local Fish Flour in Artificial Feed on Survival and Fcr of Nile Tilapia. *Jurnal Perikanan Unram*, *15*(3), 1015–1024. https://doi.org/10.29303/jp.v15i3.1518

Gunawan, A. I., Maula, R. A., Rasyid, M. U. H. A., & Rifa'i, A. (2022). Penerapan platform fishtech alat monitoring dan kontrol otomatis berbasis IoT untuk budidaya udang di Lamongan. *Journal of Applied Community Engagement, 2*(1), 8–20. https://doi.org/10.52158/jace.v2i1.266

Haryanti, T., Maknunah, J., & Karsid. (2024). Implementasi Alat Monitoring Kualitas Air Berbasis IoT Pada Tambak Udang Di Desa Pangkalan Kabupaten Indramayu. *Jurnal Pengabdian Kepada Masyarakat Nusantara*, *5*(4), 6479–6485.

Hastjarjo, T. D. (2019). Rancangan Eksperimen-Kuasi. *Buletin Psikologi*, *27*(2), 187. https://doi.org/10.22146/buletinpsikologi.38619

Hendiari, I. G. A. D., Sartimbul, A., Arthana, I. W., & Kartika, G. R. A. (2020). Keragaman genetik ikan lemuru (Sardinella lemuru) di wilayah perairan Indonesia. *Acta Aquatica: Aquatic Sciences Journal*, *7*(1), 28. https://doi.org/10.29103/aa.v7i1.2405

Jamal, N., Hidayati, Q., Zulkarnin, & Adesfar, L. (2021). Sistem Irigasi Tetes dengan Teknologi Internet of Things. *SNITT- Politeknik Negeri Balikpapan*, 1–5.

Latifah, A. L., Revaldi, M., Destianty, M. N., Selatan, K. J., Shrimp, V., & Market, G. (2025). *Peran udang vaname dalam meningkatkan daya saing ekspor perikanan indonesia di pasar global*. *3*(2), 319–325.

Made, N., Fadya, T., Ayu, I., Widawati, P., Made, N., & Rukmiyati, S. (2024). *Implementation of Digital Payment in Mitigation of Fraud Risk at Hotel Conrad Bali Implementasi Digital Payment dalam Memitigasi Risiko Fraud di Hotel Conrad Bali*. *2*(4), 423–436.

Mirza, R., Taufiq, T., & Nurdin, N. (2022). Pemantau pH Air Tambak Udang Vaname Berbasis Internet of Things dengan Antarmuka Bot Telegram. *Medika Teknika : Jurnal Teknik Elektromedik Indonesia*, *4*(1), 63–71. https://doi.org/10.18196/mt.v4i1.15720

Pauzi, G. A., Suryadi, O. F., Susanto, G. N., & Junaidi, J. (2020). Rancang Bangun Sistem Monitoring Kualitas Air Tambak Udang (Litopenaeus Vannamei) Menggunakan Wireless Sensor Sistem (WSS) yang Terintegrasi dengan PLC CPM1A. *Journal of Energy, Material, and Instrumentation Technology*, *1*(3), 103–112. https://doi.org/10.23960/jemit.v1i3.34

Safrizal, R., Aulia, R., & Adrian, D. (2025). Penerapan Sistem IoT BerbasisEnergi Surya untuk Pemberian Pakan Otomatis dan Pemantauan Kualitas Air pada Budidaya Udang Vaname. *Jurnal JTIK (Jurnal Teknologi Informasi Dan Komunikasi)*, *9*(1). https://doi.org/10.35870/jtik.v9i1.3346

Tahapari, E. H., & Suhenda, N. (2009). Penentuan Frekuensi Pemberian Pakan Untuk Mendukung Pertumbuhan Benih Ikan Patib Pasupati. *Berita Blologi*, *9*(6), 693–698. https://www.neliti.com/id/publications/67748/penentuan-frekuensi-pemberian-pakan-untuk-mendukung-pertumbuhan-benih-ikan-patin

Tobing, P. L., & Widjaja, D. (2024). Sistem Pemantauan dan Pengendalian Suhu dan Kadar Oksigen pada Model Tambak Udang Vaname dengan Teknologi IoT Monitoring and Controlling System of Temperature and Oxygen Level in Vaname Shrimp Pond Model with IoT Technology. *SENTER*, 120–127.

Zainuddin, Z., Azis, A., & Idris, R. (2015). Sistem Monitoring Kualitas Air Pada Budidaya Udang Vannamae Berbasis Wireless Sensor Network Di Dusun Taipa Kecamatan Mappakasunggu Kabupaten Takalar. *Journal Techno Entrepreneur Acta*, *1*(2), 1–6.