ABSTRAK

RANCANG BANGUN SISTEM TELEMETRI KONDISI AIR TAMBAK UDANG BERBASIS *LONG RANGE ACCESS* (LoRa) DENGAN WAHANA PERMUKAAN NIRAWAK

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Budidaya udang vannamei merupakan salah satu sektor perikanan dengan nilai ekonomis tinggi di Indonesia. Salah satu faktor utama keberhasilan budidaya adalah kualitas air, yang ditentukan oleh parameter seperti suhu, salinitas, pH, oksigen terlarut, dan kekeruhan. Penelitian ini merancang dan mengembangkan sistem telemetri pemantauan kualitas air tambak udang berbasis mikrokontroler Mappi32 dengan komunikasi *Long Range Access* (LoRa) yang diintegrasikan pada wahana permukaan nirawak. Sistem ini menggabungkan beberapa sensor, yaitu sensor suhu DS18B20, sensor pH, sensor TDS (salinitas), sensor turbiditas, serta sensor dissolved oxygen, yang kemudian datanya dikirim secara real-time ke dashboard pemantauan. Pengujian dilakukan di dua lokasi, yaitu Embung Rusunawa Universitas Lampung dan PT. Sumur Maju Tambak. Hasil penelitian menunjukkan bahwa seluruh sensor berhasil terintegrasi dengan tingkat keberhasilan 100%, sedangkan transmisi data menggunakan LoRa mencapai tingkat keberhasilan 99,49% dari 390 data yang dikirim. Kapal nirawak yang dirancang juga terbukti mampu bergerak dan bermanuver secara efektif pada seluruh titik pengukuran tanpa hambatan. Dengan demikian, sistem ini terbukti handal dan layak digunakan sebagai solusi pemantauan kualitas air tambak udang secara efisien, real-time, dan berkelanjutan, meskipun masih diperlukan pengembangan lebih lanjut terkait pemilihan sensor turbiditas dan TDS agar hasil pengukuran lebih akurat.

Kata kunci: telemetri, LoRa, kualitas air, tambak udang, Mappi32, wahana permukaan nirawak

ABSTRACT

DESIGN AND DEVELOPMENT OF A TELEMETRY SYSTEM FOR SHRIMP POND WATER CONDITION BASED ON LONG RANGE ACCESS (LoRa) USING AN UNMANNED SURFACE VEHICLE

By

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Vannamei shrimp farming is one of the fisheries sectors with high economic value in Indonesia. One of the main factors for successful farming is water quality, which is determined by parameters such as temperature, salinity, pH, dissolved oxygen, and turbidity. This study designed and developed a microcontroller-based Mappi32 water quality monitoring telemetry system for shrimp ponds using Long Range Access (LoRa) communication integrated into an unmanned surface vehicle. This system combines several sensors, namely the DS18B20 temperature sensor, pH sensor, TDS (salinity) sensor, turbidity sensor, and dissolved oxygen sensor, whose data is then sent in real-time to the monitoring dashboard. Testing was conducted at two locations, namely the Rusunawa Reservoir at the University of Lampung and PT. Sumur Maju Tambak. The results of the study showed that all sensors were successfully integrated with a success rate of 100%, while data transmission using LoRa achieved a success rate of 99.49% from 390 data sent. The designed unmanned vessel was also proven to be able to move and maneuver effectively at all measurement points without obstacles. Thus, this system has been proven to be reliable and suitable for use as an efficient, real-time, and sustainable solution for monitoring shrimp pond water quality, although further development is still needed regarding the selection of turbidity and TDS sensors to ensure more accurate measurement results.

Keywords: telemetry, LoRa, water quality, shrimp ponds, Mappi32, unmanned surface vehicle