

Optimization of Water Quality Monitoring through Integrated Analysis and Technological Monitoring Systems in the Prematuration Ponds of the Brateş Experimental Agro-Fishery Research Laboratory

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Abstract

Aquaculture is currently one of the fastest-growing sectors of global food production, a major source of high-quality protein amid population growth, declining natural resources, and the increasing demand for sustainable food systems. Water quality is a critical factor influencing fish growth, performance, health, and overall farm productivity. Key parameters such as temperature, pH, dissolved oxygen, ammonia, nitrites, organic load, and other physicochemical and hydrobiological indicators directly affect physiological balance and survival rates.

This paper proposes an integrated IT-based system for real-time monitoring and remote transmission of water quality parameters in aquaculture environments. The system combines sensors, control equipment, data acquisition modules, and digital platforms to gather, analyze, and interpret environmental data. By enabling continuous monitoring and early detection of adverse fluctuations, the system supports rapid decision-making and preventive interventions.

The transition from traditional laboratory-based analyses to real-time in situ monitoring has significantly reduced response time, operational costs, and risks associated with poor water quality. The proposed solution contributes to improving production efficiency, sustainability, and technological advancement in modern aquaculture systems.

Index Terms

Smart Sensors, Real-Time Monitoring, Aquaculture Production Management, Automated Control, Aquaculture Automation