

Hydrodynamics of a coordinates angle and periphyton recycling aquaculture framework

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Description

Aquaculture provides a reliable and efficient source of protein, essential nutrients, and income for millions of people globally. As capture fisheries face challenges of overfishing, aquaculture plays a crucial role in meeting the nutritional needs of a growing global population. Aquaculture contributes to economic development by generating employment opportunities, supporting local economies, and fostering international trade. The aquaculture industry provides livelihoods for a diverse range of stakeholders, from small-scale farmers to large commercial operations. Sustainable aquaculture practices help alleviate the pressure on wild fish stocks, allowing depleted populations to recover and ecosystems to regain balance. This reduction in fishing pressure supports the conservation of marine biodiversity. Aquaculture products are a significant component of international seafood trade, with many countries exporting a variety of farmed species. The global trade of aquaculture products contributes to economic growth and enhances food security in regions where aquaculture is a major industry. Advances in aquaculture technologies and practices contribute to innovation and knowledge transfer across borders. International collaboration and the exchange of best practices support the development of sustainable and responsible aquaculture globally. Small-scale aquaculture operations face challenges related to access to resources, market dynamics, and regulatory frameworks. However, with proper support, small-scale aquaculture can be a powerful tool for poverty alleviation and rural development. Climate change poses challenges to aquaculture, including changes in water temperature, sea level rise, and extreme weather events. Adaptive strategies, such as selecting resilient species, implementing sustainable practices, and developing climate-resilient infrastructure, are essential to address these challenges. The future of aquaculture holds promise for continued growth, sustainability, and innovation. Several areas of focus and potential developments include:

Research into alternative feed ingredients, such as insect meal, algae, and plant-based proteins, aims to reduce reliance on wild-caught fish for feed in aquaculture. Sustainable and nutrient-rich feed formulations contribute to environmental conservation and improve feed efficiency. The integration of emerging technologies, such as artificial intelligence, sensors, and data analytics, enhances precision farming in aquaculture. These technologies enable real-time monitoring, predictive modelling, and improved decision-making for optimal production outcomes. Ongoing research focuses on selective breeding programs aimed at enhancing the resilience of aquaculture species to diseases, environmental stressors, and climate change impacts. Developing disease-resistant strains and climate-resilient breeds contributes to the long-term sustainability of aquaculture. In regions with limited available land and water resources, innovations in land-based and urban aquaculture systems are gaining attention. Vertical farming, aquaponics, and recirculating aquaculture systems offer opportunities for sustainable aquaculture in land-scarce environments. The development of effective bio risk management strategies and disease prevention measures is crucial for maintaining the health and productivity of aquaculture systems.

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Conflict of Interest

The author declares there is no conflict of interest in publishing this article.

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