Steady state and dynamic models of circulating pH aquaculture systems

ME Green*

Department of Marine, University of Tasmania, Australia

Received: *02-October-2023; Manuscript No: JAEFR-23-120301;* ***Editor assigned:*** *04-October-2023; Pre QC No: JAEFR-23-120301 (PQ);* ***Reviewed:*** *18-October-2023; QC No: JAEFR-23-120301;* ***Revised:*** *23-October-2023; Manuscript No: JAEFR-23-120301 (R);* ***Published:*** *30-October-2023;* ***DOI:*** *10.3153/JAEFR.9.10.092*

Introduction

Aquaculture, the farming of aquatic organisms such as fish, shellfish, and aquatic plants, has become a crucial component of global food production. With wild fish stocks facing depletion and environmental concerns associated with traditional fishing practices, aquaculture provides a sustainable solution to meet the increasing demand for seafood. In this comprehensive article, we will explore various aquaculture systems, their methodologies, environmental impacts, and the role they play in ensuring a resilient and responsible seafood industry. These systems promote resource efficiency and sustainable food production. Advancements in aquaculture technologies play a crucial role in enhancing the efficiency, sustainability, and productivity of aquaculture systems. Selective breeding involves choosing individuals with desirable traits for reproduction, leading to improved growth rates, disease resistance, and overall performance in aquaculture species. This practice has been instrumental in developing aquaculture-specific breeds that are well-adapted to captive conditions. Genetic modification is a controversial but emerging area in aquaculture research. GMOs may be engineered for enhanced growth, disease resistance, or environmental adaptability [1,2]. Advantage Salmon, a genetically modified salmon, is an example of a GMO designed for faster growth. Automated monitoring systems use sensors and technology to continuously monitor water quality parameters such as temperature, dissolved oxygen, and pH.

Description

These systems allow for real-time adjustments to environmental conditions, optimizing the health and growth of cultivated organisms. Closed-containment systems, such as land-based recirculating aquaculture systems, offer more control over the production environment. These systems reduce the risk of disease transmission, escapees, and environmental impacts associated with open-net pen systems. Efficient nutrient management involves optimizing feed formulations, minimizing nutrient runoff, and utilizing waste by-products. Strategies for nutrient management contribute to the sustainability of aquaculture systems by reducing environmental impact. Remote sensing technologies and Geographic Information Systems (GIS) are used to monitor and manage large-scale aquaculture operations. These tools assist in mapping aquaculture sites, assessing environmental conditions, and making informed decisions for sustainable expansion. Certification programs, such as those provided by the Aquaculture Stewardship Council (ASC) and the Best Aquaculture Practices (BAP), set standards for responsible and sustainable aquaculture practices. Certified products assure consumers that the seafood they purchase has been produced in an environmentally and socially responsible manner [3-5]. While aquaculture offers a solution to overfishing and food security concerns, it also presents environmental challenges that must be carefully managed. Improper waste management and excess nutrients can lead to water pollution, negatively impacting aquatic ecosystems.

Conclusion

Advanced water treatment technologies, proper siting of aquaculture facilities, and best management practices help mitigate water quality issues. Aquaculture operations can be susceptible to diseases and parasites that may require the use of antibiotics or other medications. Implementing biosecurity measures, disease monitoring, and responsible antibiotic use are essential for sustainable aquaculture. Escapees, or farmed organisms that enter the wild, can interbreed with wild populations, potentially affecting genetic diversity. The development of sterile or genetically modified strains and proper containment measures help minimize the risk of genetic interactions. Aquaculture infrastructure, such as net pens and structures, can alter coastal and aquatic habitats. Sustainable aquaculture practices include site selection that minimizes habitat disturbance and the use of appropriate containment systems.

Acknowledgement

None.

Conflict of Interest

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

References

1. Chen H, Liu S, Xu XR, et al. Tissue distribution, bioaccumulation characteristics and health risk of antibiotics in cultured fish from a typical aquaculture area. J Hazard Mater. 2018; 343:140-8.
2. Chen JL, Huang L, Wang Q, et al. Antibiotics in aquaculture ponds from Guilin, South of China: Occurrence, distribution, and health risk assessment. Environ Res. 2022; 204(Pt B):112084.
3. Fu J, Zhao Y, Yao Q, et al. A review on antibiotics removal: Leveraging the combination of grey and green techniques. Sci Total Environ. 2022; 838(Pt 3):156427.
4. Gorito AM, Ribeiro AR, Gomes CR, et al. Constructed wetland microcosms for the removal of organic micropollutants from freshwater aquaculture effluents. Sci Total Environ. 2018; 644:1171-1180.
5. Hijosa-Valsero M, Fink G, Schlusener MP, et al. Removal of antibiotics from urban wastewater by constructed wetland optimization. Chemosphere. 2011; 83(5):713-9.

*Corresponding to

ME Green

Department of Marine,

University of Tasmania, Australia

Email: madline.green@utas.edu.au