



SCHOLARLY PUBLICATIONS School of Civil Engineering KIIT Deemed to be University

Journal Name: Science of the Total Environment

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Title: Experiments and modeling to develop a Pistia stratiotes based Floating Vegetated System (FVS) for the removal of heavy metals (Pb, Zn, Cr, Cu, Ni)

Author: Samal K., Dash R.R.

Details: Volume 926, 20 May 2024, Article number 171981

Abstract: Floating Vegetated System (FVS) emerged as a green and sustainable technology, presenting a viable solution for treating heavy metals (HMs) contaminated water without disrupting the food web. Pistia stratiotes has been used in the design of FVS due to its abundance of aerenchyma tissues, which contribute to its ability to remain buoyant. FVS exhibited significant HMs removal efficiencies, with Pb top at average 84.4 %, followed by Zn (81.1 %), Cr (78.5 %), Cu (76.5 %) and Ni (73 %). Bio-concentration Factor (BCF) and Translocation Factor (TF) values evaluated the plant's adeptness in metal uptake. For plants treated with Cu, the highest post-treatment chlorophyll content of 9 ± 1 mg.ml⁻¹ was observed while Zn induced plant shows the lowest content of 7.1 ± 0.4 mg.ml⁻¹. Using Box-Behnken Design (BBD), the system achieved 81.48 % Pb removal under optimized conditions such as initial Pb conc. of 9.25 mg.l⁻¹, HRT of 24.49 days and a water depth of 26.52 cm. ANOVA analysis highlighted the significant impact of all the factors such as initial HM conc., HRT and wastewater depth on FVS performance. Kinetic analysis estimated a closer observance to the zero-order model, supported by high determination coefficient (R²) values. In conclusion, the FVS, as one of the most eco-friendly technologies, demonstrates higher potential for treating polluted water bodies, offering a sustainable remedy to global metal pollution challenges. Research on FVS for HMs removal is an area of ongoing interest and there are several potential future studies that could be pursued to further understand and optimize their effectiveness such as optimization of plant species, enhancement of plant-metal interactions, effects of environmental factors, economic feasibility studies, disposal of heavy metals accumulated plant, scale-up and application in real-world settings, etc.



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IF: 4.6

Title: Economic feasibility study of organic and conventional fish farming systems of Indian major carps

Author: Beg, Mirza Masum; Roy, Subha; Moulick, Sanjib; Mandal, Basudev; Kim, Taeho; Mal, Bimal

Details: Volume 14, Issue 1, December 2024, Article number 7001

Abstract: Organic aquaculture is a new approach in the modern farming system. As the capital investment is higher for setting up the organic aquaculture, it is essential to conduct an economic feasibility study with compare the conventional farming system. In the current study, economic feasibility of culturing Indian major carps (IMC) using conventional culture system and organic culture system (OCS) were evaluated. IMC was cultured for three consecutive years from 2017 to 2019 in experimental ponds of 0.015 hectare (ha) area each. The crude protein content of the organic and conventional feed was maintained at the same iso-nitrogenous level (32% crude protein) but the highest production to the tune of 19 tons per ha was obtained in OCS. Further, in case of OCS, apart from fish production, vermicomposting to the tune of 45,000 kg ha⁻¹ in the first year, and 90,000 kg ha⁻¹ from second year onward is achievable by installing a vermicomposting unit of 200 tons annual capacity. Economic analysis of the culture systems assuming a project period of 10 years showed that the highest net present value (NPV) of 1.06 million USD, a payback period of one year and nine months and an internal rate of return (IRR) of 51% are achievable per ha of fish culture pond for OCS. Sensitivity analysis of various costs performed for OCS revealed that profitability of the organic fish farming investment is most sensitive to the total fish production and sale price of the organic fishes. In terms of production of fish and economics of organic culture system is proved to be the best available technique.

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