



Performance Evaluation and Modelling Studies of Gravel-Coir Fibre-Sand Multimedia Stormwater Filter

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ABSTRACT

A horizontal flow multimedia stormwater filter was developed and tested for hydraulic efficiency and pollutant removal efficiency. Gravel, coconut (*Cocos nucifera*) fibre and sand were selected as the media and filled in 1:1:1 proportion. Fabric screen made up of woven sisal hemp was used to separate the media. The adsorption behaviour of coir fibre was found out by a series of column and batch studies and corresponding isotherms were developed.

Hydraulic efficiency of the filter showed a diminishing trend as the suspended solids concentration in inflow increases. The filter exhibited 100 % suspended solids removal at lower suspended solids concentration in inflow water ($> 6 \text{ g L}^{-1}$). The filter could remove NO_3^- , SO_4^{2-} and TS effectively. Removal percentages of Mg^{2+} and Na^+ were also found good. Similar results were obtained from field evaluation study. A multiple regression equation that mathematically represents the filtration process was also developed.

Based on estimated annual costs and returns, all financial viability criteria (IRR, NPV and BCR) were found favourable and affordable to farmers for investment on developed filtration system.

KEYWORDS

Stormwater filter, fibre media, fabric screens, water quality parameters, hydraulic efficiency, pollutant removal, economic analysis, model validation