# Performance analysis of fabricated bio-filtration system for small-scaled greywater treatment: TSS and turbidity removals

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**Abstract.** River pollution, which is mainly due to excessive drainage of untreated domestic greywater, has becoming a serious concern in both poor and developing areas like Sarawak in the current years. Realizing the vital role of Sarawak rivers, the need to improve the level of pollution, demand for clean freshwater resources, as well as to save cost on household water supply, the greywater generated daily from every household needs to be pretreated for reuse, otherwise, discharged. This further demands for cost-effective pretreatment technology for domestic and residential use. This research, therefore, analyzes the efficiency of a low-cost bio-filtration system which utilizes agricultural wastes, namely rice husk and coconut coir, as bio-filter media to improve the quality of greywater effluent samples in terms of total suspended solids (TSS) and turbidity removals. This paper presents the extended results obtained from the previous research work using the same fabricated pre-treatment system, which consists of six main units i.e. wastewater storage tank, water feed tank, pre-sedimentation tank, bio-filter, post-sedimentation tank and treated water storage tank. The system is operated for six hours to complete several cycles of treatment. At every one-hour interval, both TSS and turbidity levels of the wastewater samples are recorded and the removal performances are evaluated and analyzed. Positive outcomes are attained from this research study such that the rice husk system is able to reduce the TSS and turbidity levels by 49.06% i.e. from 53.00 mg/L to 27.00 mg/L with an average rate of 4.33 mg/L.hr, as well as 57.79% i.e. from 41.70 FNU to about 17.60 FNU, at a rate of 4.02 FNU/hr respectively. Besides, the coconut coir bio-filtration system achieves TSS removal efficiency of 49.70% i.e. from 65.60 mg/L to 33.00 mg/L at mean rate of 5.43 mg/L.hr, and 63.10% turbidity removal i.e. from 48.40 FNU to 17.86 FNU, at 5.09 FNU/hr respectively.

**Keywords:** *bio-filtration, coconut coir, domestic greywater, rice husk*

## 1. Introduction

Sarawak, being one of the developing states in Malaysia, has been experiencing credibly an explosive growth in its population in the recent years and is anticipated to further expand in terms of its technology, sociology and economic status in the near future. This strongly demands for cleaner and safer environment to ensure a more sustainable and promising future. According to Kuok et al. [1], in the past, only 40% of the pollutants, excluding nutrients and bacteria, were able to be removed from the black water through the septic tank treatment whilst the greywater was directly discharged, along with the