

MAKERERE



UNIVERSITY

COLLEGE OF ENGINEERING, DESIGN, ART AND TECHNOLOGY

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

**CHARACTERIZATION OF GREY WATER IN KYEBANDO, KISALOSALO
AND DETERMINATION OF THE DESIGN CRITERIA FOR GREYWATER
SYSTEMS TREATING WATER FOR IRRIGATION**

BY

MASON ANDREW (BSc. Civil Engineering, Mak.)

**A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH
AND GRADUATE TRAINING AS PARTIAL FULFILLMENT FOR THE
AWARD OF THE DEGREE OF MASTER OF ENGINEERING (CIVIL) OF
MAKERERE UNIVERSITY**

JUNE 2014

ABSTRACT

In many urban and peri-urban communities of low and medium income countries, grey water discharge is of increasing concern as population in these areas continues growing, consequently bringing about an increase in quantities of grey water generated.

The main objective of this study was to characterize the grey water in Kyebando, Kisalosallo Zone (Kampala) and design a method of treatment so that it can be upgraded to a safe resource for irrigation

Literature review, questionnaires and observations among other methods were used for data collection. Based on our measurements, the amount of grey water generated in Kyebando is on average 65L/household/day. Analysis was carried out on grey water samples from the area of study to establish the current grey water characteristics. The characteristics of grey water in Kyebando are (on average) 483mg/L, 888mg/L, 11mg/L, 35.9mg/L, 7.9mg/L, 5845 cfu/100mL 346mg/L, 6.6 and 459 μ S/cm for BOD₅, COD, NH₄-N, TP, Ortho P, faecal coliforms, TSS, pH and EC respectively. These parameters suggest that grey water should be treated before using it at household level.

To develop a design criterion, a laboratory scale model treatment unit was set up and its performance was evaluated. A hydraulic loading rate (HLR) of 60 L m⁻²d⁻¹ and an organic loading rate (OLR) of 70 g BOD m⁻²d⁻¹ were implemented on a multi-media filter of gravel, charcoal, geotextile and mulch (charcoal being the predominant layer) operated as a batched type system, with a 24 hour retention time. The system was operated for four weeks, during which it showed remarkable removal efficiencies of 76% and 73% after 24hours for COD and BOD, respectively and 73.1% for faecal coliforms (FC). The removal efficiencies at 24 hours, of faecal Coliforms (FC), Total Phosphorous (Tot-P), and Total Suspended Solids (TSS) were 73.3%, 59.5% and 73.7% respectively. A filter system with a surface area of 0.76m² was recommended for the adequate treatment of household grey water. It treated water to meet the required standards for Irrigation.