BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATIONENGINEERING

FINAL YEAR PROJECT

DESIGN AND SIMULATION OF A CONSTRUCTED WETLAND TO TREAT THE TAIL WATER RUNOFF FROM MUBUKU IRRIGATION SCHEME

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ABSTRACT

Tailwater is the excess water that runs off the field at the low end of furrows, boarder strips, basins and flooded areas during surface irrigation. Tailwater is loaded with agrochemicals like fertilizers, pesticides, herbicides and insecticides.

Farmers apply fertilizers to boost crop yields, but not all the fertilizer applied is utilized by plants. Some of the excess chemicals are washed to irrigation canals during irrigation or rainfall and conveyed downstream. Mubuku irrigation scheme tailwater is discharged into river Sebwe which has posed a health threat to the community that draws river Sebwe water for domestic use. For example, the presence of nitrate (from fertilizer) in drinking water at concentrations greater than 50 mg/l could cause methaemoglobinaemia in babies aged less than 6 months (WHO, 1998). In addition, nitrate in the alimentary canals of humans may react with amines to form carcinogenic nitrosamines, which could contribute to the development of gastric cancer.

The tailwater from Mubuku irrigation scheme was quantified and characterized to aid in the designing the constructed wetland treatment system. Design and simulation of various components of the constructed wetland like filter media, inlet and outlet pipes, drainage system, vegetation and liner was done using the given relevant formulas. From the research 319.68m^3 of tailwater are being discharged from Mubuku irrigation scheme to river Sebwe per day with chemical and biological characteristics of BOD[248mg/l], TN[248mg/l], TP[248mg/l], COD[248mg/l] hence need for treatment before discharging to river Sebwe.

DECLARATION

I, **MUHINDO LOIDA** hereby declare that, this report is a true work of my hands and has never been presented by any person or institution for an academic award

Signature: .....

Date: ...29th - May - 2017...

APPROVAL

This report has been approved by;

Main Supervisor

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May God Almighty bless you all as we continue to pursue excellence.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

11% of the world's population has no access to potable water *(Thompson et al., 2003)*. Agricultural wastewater (irrigation tail water) is the excess water that runs off the field at the low end of furrows, boarder strips, basins and flooded areas during surface irrigation (Bahman, 2007). The cumulative flow of tail water from farms has historically posed significant environmental problems as it is discharged to surface waters like streams and rivers. The discharge contains salts, nutrients, pesticides, herbicides and other agricultural chemicals from the fields where they are used for crop protection and yield maximization (*Briggs & Coortney, 1989*). Excess agrochemicals are washed down the drainage canals leading to the river during irrigation or rainfall and deposited in the river stream. The use of agrochemicals in Uganda is increasing, and their presence in useable water continues to constitute a health hazard to the users and aquatic creatures (*Comeau et al., 1987*). Too much nitrogen and phosphorus in the water [> 5mg/l] and [> 5mg/l] lead to eutrophication of the water sources and are toxic to both humans and aquatic life (*Anderson et al., 2006*). Large growths of algae are called algal blooms which are harmful to humans since they produce elevated toxins and bacterial growth that can make people sick if they come into contact with polluted water (*Anderson et al., 2006*).

A CW is an engineered and constructed complex of saturated substrates, emergent and submergent vegetation, animal life and open water that simulates natural wetlands for man's desired uses and benefits (Steiner *et.al,* 1988; Hammer *et al.,* 1989). The wetland systems are usually more flexible and less susceptible to variations in loading rate than conventional treatment systems (Brix and Schierup 1989).Non-point source pollution is caused by polluted surface runoff that flows into rivers, lakes and groundwater (*Tousignant, 1999).*

Mubuku irrigation scheme is located in Western Uganda covering approximately 810 hectares of which 587.4 ha is cultivated land. It is dominantly used for growth of maize which requires urea as a fertilizer for its growth. Nitrogen is a major component of urea *(Kalende, 2015).*

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