



**BUSITEMA
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Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

**REDESIGN AND CONSTRUCTION OF A MOTORCYCLE POWERED WATER
PUMPING AND IRRIGATION SYSTEM.**

(CASE STUDY: NAMUKOMBE VILLAGE, BUSIA DISTRICT)

BY

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BU/UG/2018/2578

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A final year project report submitted to the Department of Mining and Water resources engineering as a partial fulfillment of the requirements for the award of a Bachelor of Science in water Resources Engineering.

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ABSTRACT

Water is an essential component of agricultural productivity and is crucial for food security globally. This project study shows that farmers in Namukombe village, Busitema Sub-County, Syanyonja parish, Busia district, in the eastern part of Uganda have heavily dependent on rainfed agriculture despite having a fresh water body. As a result, over 98% of the crops harvested are rainfed with only 2% of the crops harvested being irrigated, mostly along the banks of River Namukombe.

The existing technologies of irrigation are very expensive to install and to maintain, dependent on seasons, static and require technical expertise to operate. These have limited the variety of crops grown, all year-round agriculture, a decrease in crop variety and yield hence a decrease in farmers' income.

This system was redesigned to provide a cheap, simple, portable and mobile irrigation by use a motorcycle to pump water for irrigation. It also gives a detail of the crops commonly grown in this area with their crop water requirements. Design and sizing of the various parts of the irrigation system was done using the relevant formulas and equations mainly from FAO.

This project study gives the operation efficiency of each component, as well as a detail of the economic analysis of the system and recommendations for future innovations.

DECLARATION

I OPELI OLGA STELLA, BU/UG/2018/2578 solemnly declare that this final year project is a result of my efforts and tremendous work done during the research period and it has never been submitted to Busitema University or any other institution of higher learning for any academic award.

NAME: OPELI OLGA STELLA

REG NO: BU/UG/2018/2578

SIGNATURE



DATE: 11/01/2023

APPROVAL

This is to certify that this final year project report was written under the guidance of my supervisor on the topic “Redesign and construction of a motorcycle powered water pumping and irrigation system”.

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This is to certify that this final year project report was written under the guidance of my supervisor on the topic "Redesign and construction of a motorcycle powered water pumping and irrigation system".

Supervisor:

Mr. BENDICTO S MASERUKA

Date: ...2nd... May... 2023

Sign: ...*M. Maseruka*.....

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LIST OF ACRONYMS

Abbreviation	Meaning
ETc	Crop Water Requirement
ETcrop	Evapotranspiration rate
ETo	Reference crop evapotranspiration
Kc	Crop coefficient
IR	Irrigation water requirement
Pe	Effective rainfall
TDR	Time domain refraction index
PVC	Polyvinyl chloride
FC	Field capacity
PWP	Permanent wilting point
RZD	Root zone depletion
P	Allowable Moisture Depletion
IRR	Internal rate of return
FAO	Food and agriculture organization
GI	Galvanized Iron
HDPE	High Density Polyethylene

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CHAPTER ONE

1 Introduction

This chapter is the general overview of the entire research study and it elaborates the background of the study, problem statement, and objectives of the study, scope and justification of the study.

1.1 Background

Water is an essential component of agricultural productivity and is crucial for food security. Globally, 20% of all farmed area is used for irrigation agriculture, which produces 40% of all food produced. In general, irrigated agriculture is twice as productive per unit of land than rainfed agriculture, allowing for more crop diversification and production intensification, helping to achieve the second of the Sustainable Development Goals (SDGs), which is to end world hunger by 2040 (*UN Sustainable Development, 2022*).

In Africa, the area equipped for irrigation, currently slightly more than 13 million hectares, makes up just 6% of the total cultivated area. Eighty-five percent of Africa's poor population live in rural areas and mostly depend on agriculture for their livelihoods. As a result, agricultural development through irrigation is key to ending poverty on the continent (Ringler, 2021).

It is well known that Uganda's economic growth is centered on agriculture. With an estimated cropping intensity of 80%, the average cropped area in any given year has been anticipated to be 9,700 ha. With nearly 15% of its surface area covered by fresh water resources, Uganda now has a ratio of 0.5% between its cultivated area under irrigation and its total irrigation potential, making it one of the nations in the world with the highest irrigation potential (Nile Basin Initiative, 2022).

The existing techniques and systems for irrigation in Uganda include; drip and sprinkler irrigation systems, where irrigation water is supplied through a series of pipes installed in the field to be irrigated. Basin and furrow irrigation systems, where water is allowed to inundate either whole or part of the garden (THE WORLD BANK, 2020). There also exists a motorcycle powered system. This system was designed to pump water from the source, the water fed through a flat hose pipe mounted on a reel to a sprinkler mounted on a tripod which was used to irrigate a field (Ocen Samuel, 2019).

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