FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

REDESIGN AND CONSTRUCTION OF A MOTORCYCLE POWERED WATER PUMP FOR IRRIGATION.

(CASE STUDY: NAMUKOMBE VILLAGE, BUSIA DISTRICT)

BY

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BU/UP/2020/0379

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ABSTRACT

This design project aimed to re-design and construct a Motorcycle powered water pump for irrigation that was to be used in Namukombe village located in Busia district. Namukombe village in Busitema Sub-County, Syanyonja parish, Busia district, in the eastern part of Uganda has a fresh water body called River Namukombe.

The residents are mainly farmers and over 98% of the crops harvested are rain-fed with only 2% of the crops harvested being irrigated, mostly along the banks of River Namukombe Currently people in this area are adopting rain fed agriculture. The existing irrigation systems such as the sprinkler, drip and other portable irrigation systems would solve this problem but they are not affordable and they require technical expertise to set up (Funa Moyo, 2014). This has hindered their adoption by local farmers and has led to continued dependency on rain-fed agriculture, poor yield and poor crop diversity grown

The project's objectives include designing the components of the system prototype, fabricating and assembling the proposed system, testing the performance of the proposed system, performing an economic analysis of the system. The research was justified by the need of irrigation since continued dependency on rain-fed agriculture limits the practice of all year-round agriculture, with a limited variety of crops grown, low yield and low income for farmers, yet the demand for food keeps increasing annually coupled with the increase in the general population. They may slow the global Sustainable Development Goals (SDGs) of no poverty (1st SDG), zero hunger (2nd SDG), good health and wellbeing (3rd SDG) by 2040.

DECLARATION

I **AYEBAZIBWE DIAN**, BU/UP/2020/0379 solemnly declare that this final year report is a result of my efforts and tremendous work done during the research period. I affirm that the research conducted for this report was carried out diligently, employing reliable sources and appropriate methodologies. Any external sources used have been appropriately cited, referenced and credited.

This report has not been utilized in the acquisition of an academic award by any individual in any learning institution.

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APPROVAL

This is to certify that this final year report was written under the guidance of my Lecturer Mr. Maseruka Bendicto and co-supervisor Mr. Ologe Hector Daniel on the topic “Redesign and construction of a motorcycle powered water pump for irrigation).”

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LIST OF ACRONYMS

ETc	Crop Water Requirement
ETcrop	Evapotranspiration rate
ETo	Reference crop evapotranspiration
FAO	Food and agriculture organization
FC	Field capacity
IR	Irrigation water requirement
IRR	Internal rate of return
Kc	Crop coefficient
NDP3	National Development Plan 3
P	Allowable Moisture Depletion
Pe	Effective rainfall
PVC	Polyvinyl chloride
PWP	Permanent wilting point
RZD	Root zone depletion
TDR	Time domain refraction index

1 CHAPTER ONE: 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 a crucial element for ensuring global food security, with 20% of cultivated land dedicated to irrigation agriculture, contributing to 40% of total food output. Irrigated agriculture demonstrates twice the productivity per unit of land compared to rain-fed agriculture, ensuring a stable food supply and enabling greater flexibility in crop diversification and production intensification. This efficiency is particularly significant in the context of the second Sustainable Development Goal (SDG), aiming to eliminate global hunger by 2040 (UN Sustainable Development,2022). Efficient water use in irrigated agriculture aligns with broader sustainable development goals, fostering economic growth, poverty reduction, and environmental sustainability.

In Africa, only 6% of the cultivated land, slightly exceeding 13 million hectares, is currently equipped for irrigation. The rural areas, where 85% of Africa's impoverished population resides, heavily rely on agriculture for sustenance. Addressing poverty across the continent is closely tied to fostering agricultural growth through irrigation (Ringler 2021). Expanding irrigation infrastructure has the potential not just to enhance agricultural productivity but also to significantly contribute to poverty reduction. By ensuring reliable water access for farming, irrigation can mitigate the impact of climate variability, boost crop yields, and improve food security for vulnerable rural communities. The adoption of efficient irrigation practices further promotes the development of sustainable and resilient agricultural systems, fostering long-term economic stability.

Uganda's economic growth is intricately tied to its agricultural sector. The anticipated cropping intensity of 80% reflects a strong reliance on agriculture, with a projected cropped area of approximately 9,700 hectares in a given year. Notably, Uganda possesses abundant freshwater resources, covering almost 15% of its total surface area. Despite this substantial water availability, the current ratio of cultivated area under irrigation to overall irrigation potential stands at 0.5%, showcasing a significant untapped opportunity. Uganda's position as one of the

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5.4 Appendix