FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN OF A WATER DRAINAGE SYSTEM TO CONTROL FLOODS ON TOCHI IRRIGATION SCHEME.

BY

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God bless you all.

DECLARATION

I MENYA SAMUEL, hereby certify that this report is my original work and has not been previously submitted to any university or other higher education institution for consideration of any academic award. I take full responsibility for the data in this report

SIGNATURE ……………………………

DATE ……………………………

APPROVAL

This is to certify that this final year project report was written under the guidance of my supervisor on the topic “Design of a water drainage system to control floods on Tochi irrigation scheme.

Name: MR OKETCHO YORONIMO

Signature: ……………………………….

Date………………………………

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ABSTRACT

The Tochi irrigation scheme, located in Oyam district, northern Uganda, has been plagued by floods since its establishment in 2016. The floods have resulted in significant damage to crops, disruptions in farming activities, and abandonment of plots by farmers. The main cause of these floods is the overflowing of the Tochi River, which bursts its banks and inundates the area. Additionally, the inadequate water drainage system has further exacerbated the problem, leading to the submergence of a substantial portion of the scheme The objective of this study was to design a water drainage system for Tochi irrigation scheme to control floods. This study aimed to achieve three specific objectives: Ascertaining peak discharge through simulating a rainfall-runoff model: By modeling the rainfall-runoff. The study also performed a hydraulic model to determine the flood depth, water velocity, and water surface elevation which would aid in the design of the channels. Flood frequency analysis was done with Gumbel distribution to generate IDF curves and frequency storms that were used in flood modeling. Flood modelling was performed using HEC-HMS model software 4.11 and discharges of 93.5, 215.1, 256.6, 461, 578.9, 702.9m^3/s corresponding to floods of return periods 2, 5, 10, 25, 50 and 100year floods respectively. The model calibration was done using the Nash-Sutcliffe model efficiency (NSE). As a result, the model calibration was found to be very satisfactory with NSE 0.985. Flood analysis was done using HEC-RAS software version 6.3.1, flood inundation maps corresponding to discharges of different return periods were developed and analyzed. A 10-year return period discharge of 256.6m^3/s was considered as the design discharge of the drainage channel. Trapezoidal channels were designed with the help of manning's equation and storm water drainage formula for different 12 plots of the scheme as was divided appropriately.

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LIST OF ACRONYMS

AMS	Annual Maximum Series
ARF	Area Reduction Factor
CN	Curve Number
DEM	Digital Elevation Model
DWRM	Directorate of Water Resources Management
DWRM	Directorate OF Water Resources Management
FAO	Food and Agricultural Organization
GIS	Geographical Interface System
HEC- HMS	Hydrological Engineering Centre- Hydrologic Modelling System
HEC-HMS	Hydrologic Engineering Centre, Hydrological Modelling System
HEC-RAS	Hydrological Engineering Centre- River Analysis System
IDF	Intensity Duration Frequency
m.a.s.l	Meters above sea level
MWE	Ministry of Water and Environment
PDS	Partial Duration Series
SCS	Soil Conservation Service, USA
Tc	Time of Concentration
UH	Unit Hydrograph
W. S. E	Water Surface Elevation

3 CHAPTER ONE

3.0 Introduction

This chapter addresses the back ground of the project, problem statement, objectives, justification and scope of the study.

3.1 Background

A flood is typically defined as "the inundation of normally dry land." Flooding often occurs when river flow exceeds the channel's capacity and water overflows onto the floodplain.((Acreman, 2000).

Worldwide, flooding has caused almost 53,000 deaths in the last decade alone and economic losses of nearly US $185 billion(Alderman et al., 2012). In Africa, over the period 2008–2018, floods accounted for 65 percent of disaster events and caused 24 percent of deaths. (Messages, 2018)

Uganda experiences both flash floods and slow-onset floods, which are common in urban areas, low-lying areas, areas along river banks and swamplands causing more damage due to expanded infrastructure, human settlement and general development of the country. Each year, floods impact nearly 50,000 people and costs over $62 million (Risk & Profile, n.d.)

Uganda is now experiencing an annual trend of flooding which have had devastating effects on socio-economic activities hence affecting food security. Such disasters leave agricultural communities, especially smallholder farmers vulnerable as their capacity to respond to the shocks is significantly lower. the impact is relatively severe in terms of food production and security since smallholder farmers in rural settings contribute over 40% of total exports. This implies that the farming community should adopt techniques and practices that are resilient to flooding to guarantee continued food security(Kyoga, 2020)

Tochi irrigation scheme is located in Oyam district northern Uganda which is fed by river Tochi. the irrigation scheme was developed and constructed by the govt under the MAAIF project to boost rice farming with an objective to improve household incomes, rural livelihoods, food security and climate resilience through sustainable natural resource management(Enhancement & Programme, 2020)

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