BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEEERING

FINAL YEAR PROJECT REPORT

PROJECT TITLE

ASSESSING THE USE OF POLYACRYLAMIDE SYNTHETIC POLYMER TO CONRTOL RUNOFF AND SOIL LOSSES IN ARID AND SEMI-ARID REGIONS

(CASE STUDY: KANAWAT PARISH, KOTIDO MUNICIPALITY, KARAMOJA SUB-REGION)

BY

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

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ABSTRACT

Use of anionic polyacrylamide (PAM) as soil conditioner was found to be effective in reducing rainfall runoff and soil loss, while increasing infiltration rate. In this study, the effective granular PAM rate that best reduces runoff and soil loss was determined in the laboratory under simulated rainfall condition. Minitab17 software was used to design the experiments whose treatments were control, and then granular PAM mixed uniformly into soil at rates of 14.6g, 100.0g, 50.0g, and 85.4g under the impact of 5414.2ml, 4000.0ml, 6000.0ml,2000.0ml, and 2585.8ml of rainfall per hour. . Although all PAM rates reduced runoff and soil loss, the RRE and SLRE show that 50.0g of PAM (77.9% RRE) with 2000ml/hr. of rainfall and 14.6g of PAM (93%SLRE) with 2585.8l ml/hr. of rainfall are the most effective in controlling runoff and soil loss respectively. However, the effectiveness of PAM in reducing soil loss increased with increasing PAM rate but diminished with time over the entire duration of the simulation. Furthermore, the application of PAM leads to a better reduction in soil loss compared to runoff, as shown by the fitted line plot from the Minitab17software), with the value of R-sq. being 81.1%. Basing on the results of the software, the amount of runoff and soil loss in the study area can be seen as evident in large proportions, and it was from the model that rainfall-runoff and sediment load of Longiro river was shown to be evident

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I cannot forget to acknowledge my friends and classmates for the support, assistance and encouragement they gave me throughout this proposal.

DECLARATION

I ACHAN GLORIA, declare to the best of my knowledge that the content of this final year proposal report is a result of my own efforts and it has never been presented to any institution of learning for any kind of award.

Signature: …….

Date: …….

APPROVAL

This proposal report about research on the use of synthetic polymers to control runoff and soil loss in arid and semi-arid regions is presented to the Faculty of Engineering for examination, with the approval of my supervisors:

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This proposal report about research on the use of synthetic polymers to control runoff and soil loss in arid and semi-arid regions is presented to the Faculty of Engineering for examination, with the approval of my supervisors:

MR. BAAGALA BRIAN SEMPIIJA

Signature: ……..

Date: ……

DR. EDWIN KAMALA

Signature:  …….

Date: 11/01/2023

DEDICATION

I dedicate this report to my lovely parents for their selfless support, encouragement and providence throughout my studies, not forgetting my uncle, Rev.Fr. Norbert Otim and my sisters.

LIST OF ACCRONYMS

PAM	Polyacrylamide
IR	Infiltration Rate
UNEP	The United Nations Environmental Program
PVA	Polyvinyl Alcohol
HPAN	Polyacrylonitrile
$SL_{control}$	Soil loss in the control experiment
SL_i	Soil loss in soil treated with PAM
SLRE	Soil Loss Reduction Efficiency
RRE	Runoff Reduction Efficiency
$R_{control}$	Runoff in soil control experiment
R_i	Runoff in soil treated with PAM
HRUs	Hydrologic Response Units

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1.0 INTRODUCTION

This chapter provides relevant information on the background of the project, problem statement, objectives, justification, purpose and scope of the study.

1.1 BACKGROUND

The removal of top soil largely through surface runoff and wind erosion is one of the major causes of land degradation (FAO&ITPS, 2015), (J. An, Y. Wu, X. Wu, L. Wang, and P. Xiao, 2021).Annual soil loss worldwide was estimated at about 75 billion tons, causing economic losses of about US$ 600 billion per year, equivalent to US$ 80 per person per year (D.Pimentel, M.Whitecraft, Z.R Scott, L.Zhao, P.Satkiewicz, T.J. Scott, J.Phillips, D.Szimak, G.Singh, D.O. Gonzalez and T.L.Moe, 2010).

Vast areas of arid and semi-arid regions in Africa are characterized by hardened plinthite at the surface, indicating severe sheet erosion. These regions are noted for huge runoff, flash floods and severe gulley erosion. Arid regions by definition receive little precipitation of less than 10 inches(25cm) of rain per year, meanwhile semi-arid regions receive 10 to 20 inches (25 to 50cm) of rain per year. Surprisingly, water is an important agent of erosion in arid and semi-arid lands. Although, streams may only be active during and right after a heavy rain, running water during a flash flood can carry tremendous amounts of material

Soil surface sealing is one of the main causes of low infiltration rate, high surface runoff and Soil losses under rainfall impact conditions in arid and semi-arid regions (Meni Ben Hur and Marcos Lado, 2008). Surface runoff is the flow of water over the ground surface. This happens when soil is fully saturated or heavy rain falls over a short period of time such that it cannot be completely absorbed by the ground surface (Hua Jin, Rui Liang, Yu Wand and Prasad Tumula, 2015). Arid and semiarid regions are characterized by water scarcity and highly variable precipitation. In addition, the water resources in some parts of these regions are expected to decrease as a result of global warming. The soils in these regions are characterized by relatively low organic matter content, high levels of salinity and sodicity, and low vegetative cover, which makes them especially sensitive to structural degradation and, therefore, to changes in their

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