



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

Department of Agricultural Mechanization and Irrigation Engineering

P.O. Box 236, Tororo, Uganda
Gen: +256 - 45 444 8838
Fax: +256 - 45 4436517
Email: info@adm.busitema.ac.ug

www.busitema.ac.ug

FACULTY OF ENGINEERING

**DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION
ENGINEERING**

FINAL YEAR PROJECT REPORT

**APPLICATION OF GIS BASED MULTICRITERIA EVALUATION TECHNIQUES IN
ASSESSING POTENTIAL FOR SURFACE IRRIGATION FOR PADDY-RICE
CULTIVATION-Case study area: River Malaba Sub Catchment**

BY

SONKO ERNEST

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SUPERVISORS:

Mr. Ebic Andrew

Mr Okirya Martin

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TABLE OF CONTENTS

DECLARATION	vi
ACKNOWLEDGEMENT	vii
APPROVAL	viii
1.0 CHAPTER ONE: INTRODUCTION	1
1.1 Background of the study	1
1.2 Problem Statement	3
1.3 Main objective	3
1.3.1 Specific objectives	3
1.4 Justification	4
1.5 Scope of the work	4
2.0 CHAPTER TWO: LITERATURE REVIEW	5
2.1 Irrigation potential in Uganda	5
2.2 Rice Cultivation in Uganda.....	5
2.2.1 Factors that influence paddy rice production and qualities.....	6
2.3 Land suitability evaluation for surface irrigation.....	7
2.3.1 Structure of the suitability classification.....	7
2.4 Land suitability for surface irrigation	9
2.5 Overview of the GIS Application	11
2.5.1 Mapping for Surface Irrigation Suitability.....	11
2.5.2 Catchment Delineation.....	11
2.5.3 Remote sensing and GIS in multi criteria Decision analysis	11
2.5.4 Standard procedure for MCE	12
2.6 Analytical Hierarchy Process (AHP)	13
2.6.1 Weighted overlay analysis	14
2.6.2 Determining weights	14
2.7 Validation.....	17
2.7.1 Soil tests to be used for validation	18
2.7.2 Land suitability assessment.....	21
3.0 CHAPTER THREE: METHODS AND TOOLS.....	23
3.1 To assess the surface water availability for surface irrigation in the catchment.....	23
3.1.1 Catchment Delineation.....	24
3.1.2 Quantifying the available water in the catchment.....	24

3.1.3 SWAT Model Setup.....	24
3.1.4 Model Sensitivity analysis, calibration and validation	25
3.2 To develop a multicriteria evaluation surface irrigation suitability model.	26
3.2.1 Data collection	27
3.2.2 Clipping.....	28
3.2.3 Masking.....	28
3.2.4 Rasterization	28
3.2.5 Reclassification	29
3.2.5 Multicriteria evaluation.....	34
3.3 To assess the surface irrigation potential of the catchment based on paddy rice cropping patterns. 38	
3.3.1 Net irrigation water requirement:.....	40
3.3.2 Gross irrigation water demand.....	40
3.3.3 Suitability index for Irrigation	41
4.0 CHAPTER FOUR: PRESENTATION AND DISCUSSION OF RESULTS	42
4.1 Surface water availability assessment.....	42
4.1.1 Catchment (Study) area description.....	42
4.1.2 Slope Suitability.....	42
4.1.2 Sensitivity Analysis.....	43
4.1.3 Model calibration and Validation	43
4.2 Surface irrigation suitability model.....	46
4.2.1 Thematic layers.....	46
4.2.2 Overall suitability areas for surface irrigation for paddy rice cultivation	60
4.2.3 Validation of the model.....	62
4.3 To assess the surface irrigation potential of the catchment based on paddy rice cropping patterns. 69	
4.3.1 Water Availability.....	69
4.3.2 Calculation of crop water requirement for paddy rice	70
4.3.3 Gross irrigation water demand.....	72
4.3.4 Physical irrigation potential on Malaba sub catchment	73
5.0 CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS	74
5.1 CONCLUSIONS.....	74
5.2 RECOMMENDATIONS	75
REFERENCES	76
APPENDIX.....	78

LIST OF FIGURES

Figure 1: Flow chart of Multi Criteria Evaluation	13
Figure 2: Soil Electrical Conductivity Meter	19
Figure 3: Nitrogen Chart PPM	20
Figure 4: Shows a Delineated River Malaba sub-catchment	42
Figure 5: Shows River Malaba sub catchment slope suitability map	47
Figure 6: Shows River Malaba sub-catchment Soil type suitability map	48
Figure 7: Shows River Malaba Sub-catchment Soil Depth suitability map	50
Figure 8: Shows River Malaba sub-catchment soil Drainage suitability Map	51
Figure 9: Shows River Malaba sub-catchment Soil Texture Suitability map	52
Figure 10: Shows River Malaba sub-catchment Soil pH suitability map	54
Figure 11: Shows River Malaba sub-catchment Soil conductivity map	55
Figure 12: Shows River Malaba sub-catchment Nitrogen suitability map	56
Figure 13: Shows River Malaba sub-catchment SOIL SUITABILITY map	58
Figure 14: Shows River Malaba sub-catchment Rainfall intensity map	60
Figure 15: Shows sub-catchment Surface Irrigation suitability map for Paddy rice cultivation	61
Figure 16: Shows a suitability map with sampled points	62
Figure 18: Shows a graph of comparison between pH values from the field and model	66
Figure 19: Graph of comparison between Soil conductivity values from field and model	67
Figure 20: Shows a graph of comparison between Nitrogen content values of the model and field	68
Figure 21: Discharge comparison graph of River Malaba and Gross Irrigation water requirement	72

LIST OF TABLES

Table 1: Structure of Land Suitability orders and classes.....	9
Table 2: Weighting System for AHP.....	15
Table 3: Relative Sources of AHP.....	17
Table 4: Table showing Data that was used, sources and functions.....	27
Table 5: Shows the Slope raster reclassified values.....	30
Table 6: Shows the soil type raster reclassified values.....	30
Table 7: Shows the soil Depth raster reclassified values.....	31
Table 8: Shows the Soil Drainage raster reclassified values.....	31
Table 9: Shows the Soil Texture raster reclassified values.....	32
Table 10: Shows the Rainfall raster reclassified values.....	32
Table 11: Shows the temperature raster reclassified values.....	Error! Bookmark not defined.
Table 12: Shows the soil pH raster reclassified values.....	33
Table 13: Shows the Nitrogen content raster reclassified values.....	33
Table 14: Shows the Electrical Conductivity raster reclassified values.....	33
Table 15: Shows Random indicies of respective number of parameters.....	35
Table 16: Shows a pairwise comparison matrix of soil suitability.....	35
Table 17: Shows a Pairwise comparison matrix of surface irrigation suitability model.....	35
Table 18: Shows a Normalized Pairwise Comparison matrix for soil suitability.....	35
Table 19: Shows Normalized Pairwise comparison matrix of surface irrigation suitability model.....	36
Table 20: Shows a sample template for laboratory analysis of soil profile samples to be tested.....	Error! Bookmark not defined.
Table 21: Land Evaluation of the studied soil profile samples according to Sys and Verhey (1978).....	63
Table 22: Shows soil sample results from laboratory analysis.....	64
Table 23: Soil sample results with their respective model data.....	65
Table 24: Statistical analysis of soil pH values.....	66
Table 25: Statistical analysis of Electrical conductivity values.....	67
Table 26: Statistical analysis of Nitrogen content values.....	68
Table 27: Shows Flow discharges of River Malaba.....	70
Table 28: Shows crop water requirements of the first growing season of Paddy rice.....	70
Table 29: Shows the crop water requirements of the second growing season of Paddy rice.....	71
Table 30: Discharge comparison between river flow and Gross irrigation water requirement.....	72

DECLARATION

I **SONKO ERNEST** of REG NO **BU/UG/2016/89**, declare to the best of my knowledge that this final year project report is as result of my research and efforts.

Student's signature:

Date:

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I thank the Almighty God and my dearest mother Mary for the far that He has brought me, the gift of life, protection and his provision to me during and throughout the writing of this final project report and entire implementation of my project.

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APPROVAL

This final year project report has been submitted to the department of Agricultural mechanization and irrigation Engineering of Busitema University with approval of the following University Supervisor.

Mr. OKIRYA MARTIN

Signature.....

Date.....

LIST OF ACRONYMS

GIS Geographical Information System

MCE Multi-Criteria Evaluation

AHP Analytical Hierarchy Process

MAAIF Ministry of Agriculture, Animal Industry and Fisheries

UBOS Uganda Bureau of Standards

FAO Food and Agriculture Organization

GDP Gross Domestic Product

MCDA Multi Criteria Decision Analysis

WIOA Weighted Overlay Analysis

NaSSARI National Semi-Arid Resources Research Institute

MWE Ministry of Water and Environment

NBI Nile Basin Initiative

NELSAP Nile Equatorial Lakes Subsidiary Action Program

UNRDS Uganda National Rice Development Strategy

ABSTRACT

Irrigation has attained increasing importance the world over because of the growing demand for food by a rapidly growing world population. Uganda depends on the rain fed agriculture with limited use of irrigation for agricultural production. It is estimated that more than 90% of the food supply in the country comes from low productivity rain fed smallholder agriculture and hence rainfall is the single most important determinant of food supply and the country's economy. This study has focused on assessing the suitability of Surface irrigation for paddy rice cultivation of river Malaba sub-catchment using Geospatial techniques (ArcGIS tools) for analysis to support location decisions with respect to the implementation of Agricultural land planning and management, the study further assesses how the major water source within the catchment can be utilized to provide water for surface irrigation.

Suitability assessment for surface irrigation development for paddy rice cultivation was identified by considering the irrigation suitability factors such as slope, soil, land use land cover and rainfall distribution under the multicriteria evaluation using the weighted overlay method. Other methods including CROPWAT were utilized to determine the crop water requirements of paddy rice crop under consideration. This surface irrigation suitability analysis for paddy rice cultivation will be valuable to land managers, agricultural officers and farmers in land-use planning and management. The main aim of the case study was to identify the suitable areas for surface irrigation development for paddy rice cultivation in River Malaba sub-catchment eastern Uganda.

The total irrigable land of the sub-catchment is 59.51% (40929.75 ha) under highly suitable, 35.9% (24690.26ha) under moderately suitable for surface irrigation and the rest 3159.29ha (4.59%) is classified as non-suitable (N). The annual average minimum flow of river Malaba is estimated for every month and assessed to determine its capability to meet the gross irrigation water requirements for paddy rice in the growing months with in the season, 36.16037 cumecs are required for the first growing season (April-august) and 55.7587 cumecs are required for the second growing season(September-January). The study was carried out for river Malaba sub-catchment and it is possible to apply the exercise to other sub-catchments in the entire Mpologoma Catchment and possibly the whole country too.

Key Words: Surface Irrigation, Paddy rice cultivation, ArcGIS, MCE, AHP, CROPWAT, water availability assessment.