BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN AND SIMULATION OF A SEMI-PORTABLE SPRINKLER IRRIGATION SYSTEM FOR CHILI CULTIVATION IN ARUA

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BU/UG/2012/8

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Abstract

This study was conducted to design an effective semi- portable sprinkler irrigation system that should be adopted for chili cultivation so as to keep production continuous even during the dry seasons of the tropical climate of Uganda especially west Nile. The major components of the semi-portable irrigation system are the sprinklers, movable lateral pipes, fixed sub-main pipes, and fixed main pipes and fixed pumping plant. The use of movable lateral pipes lowers the total initial investment of irrigation by up to about 50%.

Design parameters had to be determined so as to design and effective irrigation system for the target area and these were, Crop water requirement of chili (*capsicum ssp. L*), soil infiltration rate, stream discharge and the topography of the field. The semi-portable sprinkler irrigation system was designed for an area of 4.8 Ha, having a system capacity of $23m^3/hr$ and irrigation frequency of 8 days. A computer simulation was also run to analyze the system performance, and the results showed that for the 13Hp pump selected, the system would perform normally.

Finally and economic analysis was carried out using the payback period. This showed that if the system is used effectively with proper agronomic practices to attain 90% yield, the cost of investment will be regained in the first year. Additionally the same system can also be used for other crops other than chili with a little alteration in the scheduling and time of operation.

Declaration

I, MAGUKU MATTHEW EMMANUEL, hereby declare to the best of my knowledge that the piece of this project is as a result of my personal effort and research and has never been presented in any institution of higher learning for the award of any academic reward.

Maguku Matthew Emmanuel

Sign: _____ Date: 24/05/2016

Dedication

I dedicate this project work to my dear parents Mr. Alipa John Andrua and Mrs. Alipa Lucy, for their tireless support rendered to me. May God bless you mum and dad.

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My sincere thanks goes to the Almighty God For his wisdom, mercy and grace that has been abundant upon me.

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Acronyms

EC	-	Electrical Conductivity
ET	–	Evapotranspiration
ET_C	-	Crop evapotranspiration
FAO	–	Food and Agricultural Organization
FOASTAT		Food and Agricultural Organization Statistic
GDP	-	Gross Domestic Product
HRD	-	Human Resource Development
NPA	-	National Planning Authority.
PEHD	–	Poly Ethylene High density
pH	-	Potential hydrogen (acidity/alkalinity)
PN	–	Nominal pressure
PVC	–	Poly vinyl chloride
UBOS	-	Uganda Bureau of Statistics

CHAPTER ONE

1.0 Introduction

This chapter consists of the Background, problem statement, Objectives, justification and scope of the study for the design of a pressurized irrigation system for chili. This project intends to solve the significant challenges of unreliable rainfall as far as chili cultivation in Uganda is concerned.

1.1 Background of study

According to UBOS (2012), the agricultural sector is the main stay of Uganda's economy employing over 66 percent of the labour force and contributing 22.9 percent to the GDP. The Agricultural sector has a market that is interested in diversifying the crop production (PEMconsult, 2011), among the crops that provide an alternative to traditional *cash crop* exports is chili which has the European Union as the primary export market. Chili (*Capsicum ssp.*) belongs to the family Solanaceae and is one of the most important vegetables as well as spice crops of the tropical regions (Basu and de 2003); chili is a small genus comprising of about 30 species which are of great economic importance. Five species of chili namely -(*C.annuum, C.chinense, C.frutescens, C.baccatum and C. pubescens)*- have been widely exploited in the tropical and temperate regions because of their fruits which have high nutritional contents important in human diet.(Moscone et al., 2007). Chilies are also important ingredients in many spices due to their pungency caused by the chemical substance capsaicin. Additionally, chili is used in pepper spray which has widely gained acceptance and popularity among law enforcement officers as a safe and effective way of calming violence(Johnson, 2005). Therefore, most vegetable growers around the world prefer chili due to its stable market.(Razak et al., 2013)

In Uganda, chili (*capsicum ssp).* is widely cultivated as an agricultural crop.(Mugagga, 2010) and the major chili growing regions are the Northern, North Eastern and some parts of the West Nile. According to a research carried out by Mugagga et al (2010), Chili has the highest benefit/cost ratio of 12.33 in 2005 as compared to 5.15 of maize and 4.85 of beans. A kilogram of chili costs about 4000Ush in the local market (Opio, 2014) and 3.5 £ in the international market. Furthermore, according to a report by HRD program (2004), Uganda and Kenya have been identified to jointly supply 1500 tonnes of chili per year to the European union. However,

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