DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

INVESTIGATING EFFECTS OF WATERPAD AND IRRIGATION DEPTH ON HORTICULTURE PRODUCTION

CASE STUDY: BUSITEMA UNIVERSITY, EASTERN UGANDA

BY

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A final year project report submitted to the faculty of Engineering in partial fulfillment of the requirements for the award of a bachelor's degree of Agricultural Mechanization and Irrigation Engineering of Busitema University

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Abstract

For Agriculture to develop from its current state to a state much more beneficial to the practitioners, new and better innovations have to be explored that may contribute towards enhancement of production.

The effect of Waterpads on horticulture performance was investigated in this research using tomato plants. The research was carried out at Busitema University irrigation demonstration site, located in Busitema sub-county, Busia district in eastern Uganda along Tororo-Jinja highway.

Waterpads consist of a water absorbing and water holding gel (Polymer) that ensures an efficient use of water and nutrients, leading to healthier and stronger plants. The plant roots grow into the gel and can easily extract water and nutrients.

The polymers are held in place in between a layer of paper and jute. The paper is a fully biodegradable paper. The glue used for gluing the components together is organic. The jute (also termed as hessian) mesh is made of jute and degrades in approximately 1 to 2 years (Sukru & Chevalking, n.d)

A randomized complete block design was used; waterpad amounts of 12.5g, 25g and 50g were tested and compared with the control by the least significant difference (LSD) group test method using GenStat Discovery Edition 4. The treatments were found to be significantly different from the control.

Tomatoes plants under 25g waterpad showed a better performance compared to those under other quantities and the control.

Waterpads contributed about 6.66% yield increase of marketable tomato fruits over the control plants

The overall benefit of using waterpad was found to be Shs. 1,359,400 calculated as difference between the profit of use of waterpad and that of no waterpad used. The comparison of the benefit with the cost of production of Shs. 635,760 shows that the benefit outweighs the cost and this verified the profitability of use of waterpad.

Declaration

I Obina Patrick declare that this final year project report is my original work and has not been presented in this or any other University for the award of a degree.

Registration number…………………………………………………

Signature ……………………………………………………………….

Date………………………………………………………………………..

Approval

This project report has been submitted to the department of Agricultural mechanization and Irrigation Engineering of Busitema University with approval of the following University Supervisors.

1. Mr. Mugisha Moses

Signature………………………………..

Date…………………………………….

2. Ms. Nakabuye Hope Njuki

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Dedication

My mom, Justine Aboth and dad, Edward Emuu Angesu are undoubtedly a great gift from God. Thank you for laying a firm foundation for me and showing me the right direction to take, you are my first class mentors as the short saying states “charity begins from home”.

Dearly brothers Jeremiah, Andrew, handy, Wendo Wilber, your encouragements to me fueled my progress, great you are to me. May the Almighty God keep offer you all what your heart most desire

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I indeed can't forget to appreciate my colleagues, the Collaborative BSc. Agricultural mechanization and irrigation engineering class of the year 2014, Busitema University, who are often there for me whenever I need any help. I thank them from the bottom of my heart.

Above all Almighty God, you are the master of everything, may you continue blessing us.

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List of Acronym

ETo – Reference crop evapotranspiration

ETc – Crop water requirement

WP – Waterpad

g – gram

GM – Gross profit margin

TVC – Total variable cost

CHAPTER ONE

1.0 Introduction

This chapter briefly discusses the background on level of modernity of Agriculture in Uganda, the problems in horticultural irrigation, justification, the purpose of research, objectives and scope of the study.

1.1 Background to the study

Agriculture is an important sector to the Ugandan economy that employs approximately 69% of the population(Ssewanyana, Matovu, & Twimukye, 2009) and contributes about 26% to the GDP as by the year 2015(Shenggen et al., 2015). The sector has the potential to transform the economy of Uganda in general and that of specific sectors such as manufacturing and services(Anon, Uganda Economic Outlook , 2016).

Among Uganda's Agricultural sub-sectors is horticulture, comprising of both fruits and vegetable growing. Most widely grown vegetables in the country include; tomato, cabbages, onions, fresh greens, and numerous peppers(Nakakeeto, n.d.).

Horticulture production in Uganda is largely carried out in rain fed open fields during the wet season and also a few farmers near swamps during dry seasons. This is due to the fact that most farmers do not have adequate capacity to irrigate due to the cost of water, irrigation systems and limited knowledge on water application technique. Higher water costs are brought about by frequent irrigation due to deep percolation and higher levels of evapotranspiration during dry seasons. However, horticultural production is a promising agricultural sub-sector with a growth rate of 20% per year (National Development Plan, 2009).

The type of irrigation system is important and the availability of suitable irrigation systems meets the needs of agricultural expansion. Irrigation water is rapidly becoming the primary limiting factor for crop production. Surface and subsurface drip irrigation systems were proven to increase water productivity(Rahman, Talaat, & Zawe, 2016)

Waterpads are a sandwich of jute, polymer and paper. These materials improve on their water absorption ability and thus their presence at the root zone of plants can ensure efficient use of water and nutrients (Sukru & Chevalking, n.d).

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