FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRIGATION ENGINEERING

Evaluation of Eco-Biomass Boards for Improving Soil Water Retention and Crop Productivity of Carrots.

BY

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ABSTRACT

Carrot is one of the most important economic grown vegetables. However, in Uganda, carrot productivity is low due to water stress and declining soil infertility. The application of sugar cane bagasse is an eco-friendly approach of improving soil moisture. This study was conducted to assess the impacts of Eco-biomass boards for improving water retention and productivity of carrots.

The experiment was carried out at the research site of the department of Agricultural Mechanization and Irrigation (AMI), Busitema University. The experiment was performed in ports of 30cm by 30cm with three treatments and three replications for 4 months from 23rd /9/2022 to 13th /12/2022. The treatments were Control, E-R, E-R-I where E-R meant Eco-biomass boards under rain fed while E-R-I was Eco-biomass boards under rain fed with supplementary irrigation. Soil water use was measured by mass change and moisture sensors were placed at a depth of 5cm and 20cm in the pot bag to measure soil moisture and temperature in the soil. Additionally, weighing of pot bags using a weighing scale was done daily to determine the water stored in the soil in each pot.

The result indicates that treatment with eco-boards had slightly high-water storage in pots compared to control with 36.2mm and 34.2mm respectively. It was observed at the yield weight of E-R treatment was slightly much higher than control. The size of the pots influenced on water applications since the crops had small area to extract water. Further crop evapotranspiration was estimated using pot mass which can be relatively new approach to enable farmers to know how much is required for irrigation without using modified Penman-Monteith equation of FAO. This works well with pot vegetable production and in greenhouse conditions.

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DECLARATION

NAKANWAGI OLIVER, hereby declare that this project report is an outcome of my effort and has not been presented to any institution of learning for an academic award.

Signature: …….

Date: ……/……/…...…

APPROVAL

This Final Project report has been submitted to the Faculty of Engineering for examination as a partial fulfilment for the award of Agricultural Mechanization and Irrigation Engineering with my supervisor's approval.

Main Supervisor

MS. NABUNYA VICTO

Signature…… Date……/……/…….

Co-Supervisor

MR. BWIRE DENIS

Signature……. Date……/……/…….

DEDICATION

I dedicate this report to my beloved parents; Mama and lovely DAD (RIP)in appreciation for their selfless care and support provided to me throughout my studies.

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AMI Agricultural Mechanization and Irrigation Engineering.

C Control.

E + R Eco-biomass boards under rain fed

E + R + IR Eco-biomass boards with rainfall and supplementary irrigation.

ETo Reference crop Evapotranspiration.

Kc Crop Factor

ETC Crop Water Requirement.

CHAPTER 1

1.1 INTRODUCTION

This chapter presents background information on soil degradation and water conservation. It also explains available approaches for soil water conservation and highlights of the problem statement, the objectives and the scope of the study with the justification.

1.2 BACKGROUND

Globally, soil degradation is one of the greatest threat to agricultural crop production. Soil degradation is the decrease in soil productivity and quality and mostly caused by several factors such as deforestation, use of agrochemicals, over grazing and poor agricultural practices such as shift farming and mono-cropping(Dragović & Vulević, 2021). urban expansion, industrial and commercial pollution, climatic changes and soil erosion are a major cause of soil degradation(Boer & Hannam, 2019). The current global estimates show that about 80% of agricultural land suffers moderately to soil erosion. Approximately 30% of the world's agricultural land has become unproductive and abandoned due to soil erosion leading to food insecurity(Pimentel & Burgess, 2013). Due to the changing climatic conditions, water management has become a crucial concern in areas where water is not only scarce but with erratic climate. This coupled with diminishing natural resources, arable land and unpredictable weather condition makes food security a global concern. Increasing agriculture productivity is one of the ways to achieve the zero hunger sustainable goal(SDG 2) (Byerlee & Fanzo, 2019). This is done by employing good agriculture practices such as mulching, water management, green house farming and more. Mulching is the practice of covering the surface of soil with mulches to reduce moisture loss, control weed growth, improve soil fertility, and maintains temperatures in the soil especially the root zone, it controls and reduces evaporation losses by cutting off solar radiation falling on the ground(Ghouse, 2020) thereby increasing soil water retention. There are different types of mulches employed to improve on the quality of the environment(Lalljee, 2013) i.e.; organic and inorganic mulches.

In Uganda different mulches have been used mostly plastic mulches and organic mulches like grass. However the plastic mulches has drawbacks such as being non-environmentally friendly and contaminate the soil with phthalate, phthalic acid esters due to thermal degradation, challenge of collection from the field and recycling and mostly burned leading to air pollution

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