Faculty of engineering

Department of Agricultural Mechanisation and Irrigation

Evaluation of the Effect of Different Irrigation Regimes on Evapotranspiration and Yield Components of Kale

Final Year Research Project

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Acknowledgement.

I acknowledge with great pleasure the department of AMI and especially my supervisors; Mr. Bwire Denis and Madam Nabunya Victo for their guidance and support during research development and implementation process.

Dedication

This final year project report is dedicated to my family members particularly my father Mr. Olupot Andrew and Mrs. Anyango Rosemary, may God bless you all in all your work.

Declaration

I OBBO ALEX declare that this final year Research project report is of my research.
This work has not been presented in this or any other university for the award of a degree.

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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 Supervisors

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Abstract

This study examined the effects of different irrigation regimes on evapotranspiration and yield components on kale vegetable. The experiment was carried out in pots with three varying irrigation regimes at 100% ETC, 50%ETC and control (0% ETC) as treatments and three replications, where ETC means crop evapotranspiration requirement. The research was conducted on kale vegetable (gorgia variety) at Busitema University demonstration site in pot bags of 30cm*30cm. The research study also focused on developing simpler and easier irrigation scheduling technique that can be applied by greenhouse and urban farmers. Under this, three irrigation scheduling models were examined thus evapotranspiration based on Penman Monteith formular, pot mass weighing and evaporation measurements. The results from yield output indicates that more yield output can be achieved through reduced ETC application. The results obtained from this study indicate that irrigation scheduling is possibly through direct pot weight measurement and pan evaporation approach in addition to the penman monteith approach. The optimal values of ETC for the three models were 1.400mm/day for weight measurement, 1.448mm/day for penman monteith and 0.609mm/day for pan evaporation. The results for leaf yield output for the different irrigation treatment were 3.254Mg/ha, 1.981Mg/ha and 0.849Mg/ha for 100% ETC, 50% ETC and 0% ETC respectively. Though T1 gave the highest yield output, it did not double that of T2(50%) ETC where half T1 treatment was applied.

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1 CHAPTER ONE.

1.1. Background.

The global population is projected at 9.8 billion people by 2050 and at 12.6 billion in 2100 while the population in Sub-Saharan Africa (SSA) is predicted to increase by 86%. Agricultural land is shrinking due to the need to settle the growing population and industrialization (KC, Samir, 2017). The uncertainty of the projected future world population size (6.9 to 12.6 billion in 2100) reflects a very significant uncertainty about future fertility of population (KC, Samir, 2017). However, due to the growing population, natural resources (soil and water) are constantly under pressure and require a systematic and precise approach to increase the productivity of agricultural crops (Ranjan, Prem, 2017). However, feeding the future population requires developing more sustainable agricultural practices to utilize the limited land and water resources. Global food production must rise to 70% by 2050 to feed over 9 billion people worldwide (Hassan, M. Auwal, 2013).

Vegetable farming is one of the most prioritized foods whose production can be carried on a small scale and vegetables including kale plays a vital role in contributing to food security globally. Kale (Brassica oleracea var. encephala) is a leafy green vegetable that is widely consumed due to its high nutrient content, including vitamins A, C, and K, and its potential health benefits such as anti-inflammatory and anti-cancer properties. Kale has received recent attention from the health and nutrition sectors due to its nutrient profile (Migliozzi, Megan, 2015). Kale ranks high on the list of the healthiest foods or super foods. In a study that developed a classification scheme defining powerhouse fruits and vegetables as foods providing 10% or more of the daily value per 100 kcal of 17 qualifying nutrients, kale was ranked 15 out of the 41 foods that satisfied the powerhouse criteria (Shahinozzaman, Md, 2021). Kale cultivation requires a significant amount of water, and water scarcity is a major issue in many parts of the world. The UNFCCC states with respect to food security in Africa that, due to climate change, yields from rain fed crops could be halved by 2020 in some countries. Net revenues from crops could fall by 90% by 2100 (UNFCCC, 2007) (Nicol, A.; Langan, S.; Victor, M.; Gonsalves, J, 2015). In Uganda, kale vegetable is grown highly in Gulu, Karamoja and even Busia districts where it serves as not only the primary means of subsistence

APPENDICES 5: shows sieve weight measurement

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