

BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING
DEPARTMENT OF AGRICULTURAL MECHANIZATION
AND IRRIGATION ENGINEERING.

FINAL YEAR PROJECT REPORT.
DESIGN AND SIMULATION OF A FERTIGATION CONTROL
SYSTEM FOR ROSES
“FOR UGANDA HORTECH LIMITED (UHL)”.

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ABSTRACT:

Uganda Hortetch Limited is one the producers of roses in Uganda. However they use archaic methods of fertigation which calls for improvement for better results. This project was therefore focused on the design and simulation of fertigation control system for the above mentioned company

Inefficient management of nutrient inputs has put a large constraint on the environment and human's health. Indiscriminate use of nitrogen and phosphorus fertilizers has led to ground water pollution. So the farmers have to pay close attention to nutrient management and incorporate the concept of balanced plant nutrition into their farming techniques. The balanced nutrition level to plant is provided by managing PH and Electrical conductivity(EC) level of fertilizer solution according to soil pH and electrical conductivity. Developed system comprises of two sensors to measure pH and EC of the fertilizer solution and soil. Microcontroller will turn ON and OFF particular solenoid valve to pore the fertilizers into the mixing tank according to the pH and EC level in the mixing tank solution. LCD is used to display the computed results. PH and EC level of fertilizer solution is maintained on the basis of output readings of EC and pH sensors.

In the course of the study, data was collected through literature review, discussions, consultation, extensive interviews and personal observation at site to come up with the best results of the study which led to concise and appropriate material selection that best suit the modeled system on the hardware. The system was modelled using proteus software followed by simulation and finally Embedded C Programming language for coding using Arduino. The design consists of a microcontroller to receive input signals from the EC and PH sensor, processes the data acquired and then sends the output signal to the LCD were they are displayed on the screen via its digital output pins. Results showed that the best PH ranges for Roses to survive and produce more yield was 5.5- 6.5 and that of the EC was 1.2 – 1.8. The system's validity was tested using Parameter Variability – Sensitivity Analysis and its economic viability were determined during the course of the study by use of NPV method and it showed that the project is viable once it's being implemented.

DECLARATION

I KAGGWA GERALD hereby declare to the best of my knowledge that the work presented in this proposal is my original work and has not been presented in any institution of higher learning/University for similar awards.

SIGNATURE

Gerald Kaggwa
.....

DATE

23rd - May 2016
.....

Kaggwa GERALD

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APPROVAL

This project proposal under the title “Design and Simulation of a fertigation control system for UHL” has been under supervision and is hereby approved in partial fulfillment of the requirements for the award of a Bachelor’s Degree in Agricultural Mechanization and Irrigation engineering.

Main Supervisor

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CHAPTER ONE: BACKGROUND

1.0 Introduction

Uganda's floriculture exports are targeted at main two segments on the market: cut Roses and chrysanthemum cuttings and the other products are potted plant and foliage. The total size of operations is 178 hectares, with 145.5 hectares under roses, 30.5 devoted to chrysanthemums, and 2.1 hectares producing potted plants and foliage (UFCP, 2010).

The Floriculture sector is one of Uganda's top ten foreign exchange earners contributing close to \$ 30 million in export revenue. The sector has grown from a single 2 hectares farm in 1992 to 20 farms covering 192.1 hectares in 2009(Grounds & Kampala, 2007). Investment in the sector stands at over US \$ 54 million employing more than 6,000 people(Singh & Shaligram 2014). The sector produces over 40 varieties mainly – Roses (70%), Chrysanthemum cuttings 25% and potted plants(Wageningen, 2011). The main flower growing areas in Uganda are in the central region around the Lake Victoria basin – in districts such as Entebbe, Mpigi, Mukono and Wakiso. According to Keith Henderson, executive director of the Uganda Flower Exporters Association (UFEA) describes this climate as follows: "With two rainy seasons per year, there is ample water for irrigation all year round from lakes and swamps that never dry out. Even in locations further from the lakes, water can be found only a few feet below ground (Hulst, 2005). Uganda lies in the tropics where the temperatures are favourable especially around Lake Victoria where they range from maximum 28°C daytime down to around 18°C at night Plus a combination of high soil fertility and ample rainfall make Uganda extremely suitable for horticultural crop production(Conditions & Force 2006). However, poor rainfall and drought severely affected the agricultural sector which reduces the overall growth in agriculture(MAAIF, 2011),

Horticulture is associated with a number of intensive practices that collectively make up the horticultural arts. These include various propagation techniques incorporating special plant structures such as bulbs, corms, or runners; the use of layers or cuttings; budding and grafting; and micro-propagation involving tissue culture. Cultural practices include soil preparation, direct planting or transplanting; fertilization; weed, disease, and pest control; training and pruning; the use of controlled environments such as greenhouses or plastic tunnels; applications of chemical growth regulators; various harvest and handling methods; and various postharvest treatments to extend shelf life. Other practices associated with horticulture are breeding and genetic techniques for crop improvement, marketing methods, and food processing(Day et al. 2015).

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