



**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*



FACULTY OF ENGINEERING  
AGRICULTURAL MECHANIZATION AND  
IRRIGATION ENGINEERING DEPARTMENT

**DESIGN OF A SOLAR- POWERED DRIP- IRRIGATION  
SYSTEM FOR PASSION FRUITS IN BUMWANGU  
VILLAGE**

BY

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**DESIGN PROJECT SUBMITTED FOR PARTIAL FULFILLMENT  
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## ABSTRACT

The need for irrigation and use of Renewable energy sources in Uganda cannot be over emphasized. Due to its tropical location, Uganda is endowed with a wide variety of succulent, tropical Fruits. Yet the supply keeps on reducing due to farmers relying on rainfall which is often seasonal, inadequate and not uniformly distributed.

Information about passion fruit production especially in Uganda, solar energy, drip irrigation and other methods of irrigation was gathered.

To aid in the design, climatic data (Rainfall, Temperature, Relative Humidity, Sun Shine and Wind Speeds) was collected. Soil and water tests were also carried out to obtain the suitability of the soils and water for crop growth. A topographic survey using a global positioning satellite machine (GPS) was also carried out to attain the nature of landscape, proximity and availability of resources relevant to design of the system.

Different methods and programming software like Microsoft excel software, Matlab programming language, CROPWAT 8.0 and CLIMWAT 2.0 Irrigation software were used to analyse the data and AutoCAD software to generate the design drawings

Important results design of a solar powered drip irrigation system with a system capacity of  $1200\text{m}^3/\text{hr}$ , pump Head of 36m, 3blocks with 3Hrs of operation per block, 20 laterals uPVC 20.8mm in diameter with two emitters for each plant, main line 125m long PVC 31.3mm in diameter and the design storage tank is of capacity 12000litres. Pump specifications; submersible solar pump of (500W, 48V), solar panels of 125Watts, 12V each four in number connected in series.

Furthermore the project was costed to assess the feasibility of the farmers adopting the technology

In conclusion, solar powered drip Irrigation in Bumwangu village is very possible given the readily available water resources neighboring it and solar energy of 5peak hours per day. The Project if implemented is expected to improve on the agricultural, nutritional and economic welfare of Bumwangu community by ensuring continuous production and supply of passion fruits, help in research as the government looks forward for modernization of Agriculture using solar powered pumps.

## DECLARATION

I Masaaba Rogers declare that this final year project report is my original Work and has never been submitted to any institution of higher learning for any academic award.

Signature..... M/R .....

Date..... 24<sup>th</sup>/05/2013 .....



## APPROVAL

This final year project report has been submitted for examination with approval from the following supervisors.

Ms Abbo Jacqueline

**MAIN SUPERVISOR**

SIGNATURE.....

DATE..... 25<sup>th</sup> MAY 2013

Mr Okirya Martin

**CO-SUPERVISOR**

SIGNATURE.....

DATE .....

## DEDICATION

I dedicate this report to my beloved Mother Mrs Mary Khainza for her selfless care, love and support given to me ever since my childhood. I appreciate you for the spirit of hard work, courage and determination you have instilled in me.

## ACKNOWLEDGEMENT

First and foremost, I give thanks to God for his unlimited grace and love upon my life.

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## LIST OF ACRONOYMS

Ah	Amp Hours
ETc	Crop water requirement
ETo	Reference evapotranspiration
FAO	Food and Agriculture Organization
GPS	Global Positioning System
Ke	Crop co-efficient
NWSC	National Water and Sewerage Corporation
PV	Photo Voltaic
TDH	Total Dynamic Head

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## INTRODUCTION

This chapter summarizes the relevant information for the study and clearly shows the problem of interest for the proposed design. It also shows how the research will reduce the problem through the fulfilment of the specific objectives mentioned.

### 1.1 Background

Due to its tropical location, Uganda is endowed with a wide variety of succulent, tropical Fruits. Fruits contribute a big share of the country's non-traditional agricultural exports and to the nations exchange economy. The major fruits produced include: Passion fruit, Jackfruit, Citrus, Pineapple, mango, Avocado, Apple banana, Bogoya (Cavendish), Watermelon, Guava, Grape, Strawberry, Melon and Tree tomato (Ssemwanga, Jan 2007).

From time memorial Uganda has depended on agriculture as a means of lively hood for her people. Uganda today is seeing an evolution of its agricultural practices from the traditional methods to new technologies. One of the most crucial and important of them all is the practice of irrigation which is the artificial supply of water to crops so as to maintain and increase the level of production and quality.

Irrigation ensures food security, but it is yet to be adopted by many farmers in Uganda and less than 1% of ordinary Ugandan farmers irrigate (Kato, 2010). The article further more states that majority of Ugandan farmers depend on rain water for crop production because the rains have been relatively good over the past years with Uganda having two rainy seasons, one running from March to May and the other from October to December but in the recent past climate change has affected the seasons and has made them unpredictable.

Drip irrigation in particular involves application of water onto the soil (directly at the root zone) at very low flow rate from a system of small diameter plastic pipes fitted with outlets (emitter). The basic concept underlying this method is to supply the amount needed by crops as often as possible so that water is applied close to the plant and that only that part of the soil immediately

Surrounding the plant is wetted. Drip irrigation is ideal for crops such as fruits because it is highly efficient and the economic returns from fruits are high enough to compensate for the cost incurred during set up and maintenance of a drip irrigation scheme.

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