FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN AND FABRICATION OF A DOMESTIC SOLAR DRYER FOR BANANA FRUITS

BY

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MAY 2016.

DECLARATION

I ***Nakanyike Regina Mary BU/UG/2012/1771,*** declare that this project report is my original work organized with the help of my supervisors and has never been submitted to any institution of learning for any academic award.

Signed: .....

Date: 17/05/16

APPROVAL

This is to certify that ***Nakanyike Regina Mary*** prepared this project report under my supervision and is now ready for presentation to the Department of Agricultural Mechanization and Irrigation Engineering of Busitema University for an award of a Bachelors degree of Agricultural Mechanization and irrigation engineering with my approval.

Signature: .....

Mr. Owaa John Elias Sultan Date 18/05/2016

MAIN SUPERVISOR

Signature: .....,

Dr. Catherine Wandera Date.../...../.....

CO-SUPERVISOR

DEDICATION

I dedicate this report to my daughter Tabitha, my mother Mrs. Justine Nsubuga, my brothers and sisters.

ACKNOWLEDGEMENT

First and foremost I thank the almighty God who has been with me since I started this project work; glory and honour be unto Him.

I am greatly indebted to my project report supervisors Mr. Owaa John Elias Sultan and Dr. Catherine Wandera who tirelessly advised and guided me throughout the preparation and organization of this project report; may the almighty God reward them abundantly.

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EXECUTIVE SUMMARY

Many farmers of the world are faced with the problem of reducing the moisture content of their harvested crops to prevent spoilage during storage (Bukola and Bolaji, 2008); banana is one of the most important crops in Uganda with 16 million people depending on the plant as a source of food and income (Kikulwe, 2008). According to (Byarugaba, 2000), Uganda produces a lot of cooking bananas of lack of value addition most of it goes to waste. Well as traditional sun drying is the oldest, simplest and widely used method, it is unhygienic and time consuming. In addition, the direct mode dryers being used are associated with long drying hours and loss of the product quality. Improved sun dryers are expensive because they require more than one energy source. A solar dryer utilizing energy from the sun and a slotted air chamber for proper heat distribution to drying trays in the drying chamber was designed, fabricated and tested in this study and was be for use by farmers for drying of bananas in rural areas of Uganda and at the domestic level.

The production potential of bananas in Uganda, characterization of bananas varieties grown in Uganda as well as the different drying methods and technologies were presented in chapter two of this study; additionally the different ways in which dried banana products could be utilized were presented.

Chapter three presented the various methods and tools that were used in achieving the objectives of the study which included; characterization of the banana varieties grown in Uganda, design of a solar dryer for drying bananas, fabrication of a prototype of the solar dryer as well as performance testing and economic evaluation of the dryer.

The major findings and discussion of the results from the performance testing of the dryer were presented in chapter four of this report.

Chapter five presented the challenges faced in carrying out this study, the conclusions as well as recommendations.

This report also contains lists of references and appendices

ACRONYMS

hrs	hours
i.e	that is to say
m^2	square meter
m^3	cubic meter
e.t.c	etcetera
J/Kg	Joules per Kilogram
MT	million tones
g	grams
e.g	for example
NPV	Net Present Value
ppm	parts per million
kJ	Kilo joule
W/m^2	Watts per meter squared
FAO	Food And Agricultural Organisation
UNCST	Uganda National Council for Science and Technology
Lat	Latitude

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CHAPTER ONE

1.0 Introduction

This chapter presents the background to the study, problem statement, objectives, justification, purpose, as well as scope and limitations of the study.

1.1 Background

Most of the farmers of the world are normally faced with the problem of reducing the moisture content of their harvested crops to prevent spoilage during storage. The situation is worse for farmers in the rural areas of developing countries where there is no access to electricity and harvested crops are often stored in heaps (Bukola and Bolaji, 2008). Banana is one of the most important crops in Uganda with 16 million people depending on the plant as a source of food and income (Kikulwe, 2008). According to (Byarugaba, 2000), Uganda produces a lot of cooking bananas of lack of value addition most of it goes to waste; thus losses from bananas as an agricultural produce in banana growing in the rural areas of Uganda are an important issue. The practical use of the energy from the sun for the purpose of drying agricultural products will go a long way in reducing post-harvest losses (Lawrence, 2013).

Traditional sun drying is one of the oldest, simplest and widely practiced drying method by local farmers in the rural areas. The process requires relatively low capital investment, large drying area, is time consuming and is generally unhygienic. Mechanized dryers, which are of recent being preferred to the traditional open air sun drying process, are much faster in drying process, use less drying area, but require a substantial quantity of fossil fuels or electricity to operate which makes it energy intensive (Ertekin and Yaldiz, 2004; Giri and Prasad, 2007; Ajao and Adegun, 2009; Yesilata and Aktacir, 2009). However, the ever rising cost of electricity and natural fuels coupled with the growing concern about their availability in both the short and long terms, has resulted in growing interest in the use of renewable resources especially solar energy; in both direct and indirect forms (Adaramola *et al.* 2004; Koua *et al.*, 2009); most of the solar dryers are however associated with high humidity levels in their drying chambers that results in longer drying hours of the crop under consideration.

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