BUSITEMA UNIVERSITY
*Pursuing Excellence*

**FACULTY OF ENGINEERING**

**DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING**

**FINAL YEAR PROJECT REPORT**

# DESIGN AND CONSTRUCTION OF AN ELECTRICAL GROUNDNUT ROASTER MACHINE



**NABUGAWA LENA.**

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**SUPERVISOR:** **Mr. Kilama George**

***A project report submitted to the Department of Chemical and Process Engineering in partial fulfillment of the requirement for the Award of the Bachelor's Degree in Agro-Processing Engineering of Busitema University,***

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## ABSTRACT

Ground nut roasting is one of the most important stages in groundnut processing .It is a process of pyrolysis (time temperature dependent) which, by increasing the temperature of the groundnuts from room temperature to 150°C and above, brings about marked physical and chemical changes in the groundnuts that improve the quality of the groundnuts.

The purpose of this project was to design and construct an electrical groundnut roaster machine for helping groundnut farmers improve on the quality of their products which would yield high market prices hence improving their economic wellbeing and this was achieved by roasting under controlled time and temperature conditions in order to reduce loss of desired aromas to the environment and attain uniform roasting of the groundnuts.

The design of the various machine parts was carried out by analyzing forces acting on them. Force analysis led to selection of proper materials to withstand the forces to avoid failure. Stainless steels of various grades were the main materials recommended to be used because they are food grade, strong and durable. Engineering drawings of the various components were drawn before the various components were constructed and then machine parts fabricated. A fully functional prototype resulted after all the above operations. Testing of the prototype was carried out and the figures revealed that the machine was 72.7% efficient. The groundnut roaster has a total cost of 1,605,000 UGX which includes all the taxes, cost of material, machinery and hired labor to construct the machine plus overhead costs. The cost evaluation analysis of the project was based on the payback period method, the project was evaluated to breakeven in 1.23 years and on net present value method with NPV of 1,000,739 UGX over a period of five years.

## DECLARATION

I NABUGAWA LENA hereby declare to the best of my knowledge that this is my true and original piece of work and has never been submitted to any university or institution of higher learning by anybody for any academic award.

Signature.....

Date .....

## APPROVAL

This proposal report has been submitted for examination with approval from:

**Main supervisor**

**Mr. Kilama George**

Signature .....

Date.....

## DEDICATION

This report is dedicated to my beloved parents Mr. WEBUNDU LAWRENCE and Mrs. WEBUNDU JESSICCA in appreciation for their generous care and constant support provided to me all my time at school, and for the constant guidance and strength, courage and determination instilled into me, which have indeed made me what I am today, To my brothers and sisters and all my Class mates (Busitema University). I also dedicate it to my friends for the guidance and support that they have given me during my research, May the Almighty God reward you abundantly for such great work.

## ACKNOWLEDGEMENT

Great thanks go to God Almighty for giving me strength, good health, wisdom, protection and His mercies and favor throughout the research process.

My sincere thanks goes to my supervisors Mr. Kilama George and all my lecturers for their selfless guidance, knowledge and encouragement given to me throughout the writing of this report.

Finally, I thank all my friends and class mates (Agro Processing Engineers) for all the support and advice they have given me during my proposal report writing. May the Almighty God

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# CHAPTER ONE: INTRODUCTION

## 1.1BACK GROUND

Groundnuts (*Arachis hypogea* L.) , are an ancient crop that originated from south America (southern Bolivia) where it was cultivated as early as 1000 BC. Cultivated as early as 1000 B.C. This crop was spread to Africa, Asia, Europe, and other places in the sixteenth and seventeenth centuries

Global peanut production in 2014-2015 was 39.98 million tons, which was slightly less than the record crop for 2013-2014 year of 40.16 million tons (USDA, 2015). With china, India and the united states being the leading producers(Crop, 2001). They account for 70% of the world's production. China produces about 17 million tones and India producing about 9.5 million tones (USDA 2015). Today, it is grown in areas between 40 degrees South and 40 degrees north of the equator, where average rainfall is 500 to 1200 mm and mean daily temperatures are higher than 20 degrees. (Crop 2001)

Ground nuts are the second most important legume in Uganda after beans. It's mostly grown in the Northern and Eastern Uganda. (Okello et al. 2012). The ground nut varieties are the red Valencia type but of a very mixed nature ranging from large seeded manyema group e.g. Roxo to small seeded group e.g. ted beauty. They are a major source of proteins, vitamins, carbohydrates and fats since they contain about 40-50%fat, 20-50 % protein ,10-20% carbohydrates depending on the variety(Okello, Biruma, & Deom, 2010).

Uganda produced 140.000 metric tons in 2005 from 250.000 hectares of land with most of the crop being grown in the northern and eastern part of Uganda (Okello D.K., Biruma M. 2010)

About two thirds of world production is crushed for oil, which makes it an important oilseed crop. The oil is used primarily for cooking, manufacture of margarine, shortening and soaps. Seeds are consumed directly either raw or roasted, chopped in confectioneries, or ground into peanut butter. Young pods may be consumed as a vegetable, while young leaves and tips are utilized as a cooked green vegetable. Scorched seeds may serve as a coffee substitute. ("INTRODUCTION Groundnut (" 2001).