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**BUSITEMA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF AGRICULTURAL MECHANISATION AND
IRRIGATION ENGINEERING**

**FINAL YEAR PROJECT
DESIGN AND FABRICATION OF A DUAL POWERED ROASTED
GROUNDNUT PEELING MACHINE.**

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BU/UP/2013/158

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Final year project report submitted to Dept. of Agricultural Mechanization and Irrigation Engineering as a partial fulfillment for the award of Bachelor's Degree in Agricultural Mechanization and Irrigation Engineering of Busitema University.

MAY, 2017

ABSTRACT

This project report comprises of four chapters; Chapter one presents background to worldwide groundnut production and consumption with specific emphasis on Uganda's progress in groundnut production.

The problem considered in this study is presented in the problem statement and the justification, objectives and scope of the study are also presented.

Chapter two discusses the details of the various aspects involved in groundnut production with emphasis on the aspect of peeling the roasted groundnut and the operation of the existing groundnut peeling machines are presented

In relation to the objectives of this study, the methods and procedures that were followed in order to come up with the design of a dual powered roasted groundnut peeling machine, the procedures that were used to fabricate and test the performance of the prototype were also handled.

The capacity of the fabricated roasted groundnuts peeling machine was 120kg/hr. the machine runs on a single phase two horse power motor with speed of 1440rpm and frequency of 50Hz. The peeling efficiency of the machine when operated manually is 83.3% and the losses were 0.335kg. The losses in the machine are due to difference in the groundnut sizes, moisture content, and losses due to improper setting of the allowance between the drum and the adjustment plate.

During operation using a motor the efficiency was 87.35% and the losses were 0.225kg.

The machine returns UGX 2 for every unit UGX shilling invested in it. The peeling machine is affordable and used on small scale. However to reduce on the losses, it's recommended that one should roast the groundnuts to their proper moisture content 2-5 dry bulb temperature, proper adjustment of the machine.

DECLARATION

I *NYIRO JULIUS* declare that the work in this report was carried out in accordance with the Regulations of Busitema University. The work is original except where indicated by special reference in the text and no part of the report has been submitted to any other university for examination and degree award. Any views expressed in the report are those of the author and in no way represent those of Busitema University.

SIGNATURE:

DATE:

APPROVAL

I hereby do present this project report for approval as supervised for the process for which it's being written.

Sign..... Date.....

MR. ATOCHON SAMUEL

Sign.....Date.....

MS. KABASA SALLY MARY

ACKNOWLEDGEMENTS

I acknowledge firstly God the Almighty, I return thanks to the management of Busitema University, faculty of engineering for considering final year projects as one core activity for strengthening engineering skills in her students. Thanks to the head of department Agricultural Mechanization and Irrigation Engineering, Mr. KAVUMA CHRIS and all the lecturers, without their lectures and general guidance, inter-relating theory with practical would be impossible With heartfelt gratitude, I appreciate the personal contributions of MR. ATOCHON SAMUEL and MISS KABASA SALLY for their guidance during the course of writing this proposal Lastly, all my colleagues and friends and who stood by me during the course of study at Busitema University

DEDICATION

I dedicate this final year project report to my family members, parents, am very proud of you and without you I would not have reached this far. May God bless you abundantly.

To my friends Florencee, Grace, Nancy, Enoch, Stewart, Sadam, Lawrence, God bless you for your support physically and spiritually.

ACRYNMS

IISTE - International Institute for Science, Technology and Education.

GDP-growth domestic product

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CHAPTER ONE: INTRODUCTION

1.1 Background



Figure 1 Roasted Groundnuts

roundnut (*Arachis hypogaea L*), belongs to the pea bean family and it is considered as a nut because of its high nutritional value. Is one of the major oilseed crops of the tropics and subtropics, although it is also cultivated in the warm areas of the temperate regions. It is a valuable source of edible oil (40-50%) and protein (24-35%) for human beings, and of fodder for livestock (Association, National Edible Oils Distributors) About two thirds of world production is crushed for oil and the remaining one third is consumed as food (savage and keenan, 1994)

Peeling is a technical term for removing a seed coat from the groundnuts. The groundnut skins have traditionally been treated by groundnut processors as a waste product and sold off as poultry feed. Groundnut butter is made without the skins for a number of reasons among them concerns freshness, if not removed properly the natural oil in the skins may become prematurely stale and cause off flavors when the butter is being made. And also consumers tend to prefer groundnut butter without the reddish brown specs than making them with the skin (Lee Zalben 1998)

This particular design considered in this work is expected to have an improved efficiency over previous designs. It is also expected to have especially well designed peeling chamber which will greatly minimize breakages during the process of peeling. In Ogunwole's design, there is low efficiency due to limited spacing in the peeling chamber and he only focused on high production, he did not consider small scale farmers and high costs. With the development of the machine

REFERENCES

- Ogunwole O.A. (2013). Design, Fabrication and Testing of An Electrically Operated Roasted Groundnut blanching Machine. Journal of food science and quality management, international institute for science, technology and Education.
- Akintade, A. (2015). Development and Performance Evaluation of a. Journal of Multidisciplinary Engineering Science and Technology (JMEST), 271-276.
- Association, National Edible Oils Distributors. (n.d.). 2013.
- Kaaya and warren. (2005). Post harvest management of aflotoxin contamination in uganda. Wageningen Academic publishers.
- National Semi-Arid Research Resources Institute. (n.d.).
- Okello et al. (2010a). Ove view of groundnut reseach in uganda. University of Georgia.
- Savage and keenan. (1994). Introduction to genetic variability for fatty acid composition in a large-seeded groundnut variety through induced mutagenesis.
- Ugwuoke, I. C. (2014). Design and Development of Manually Operated Roasted . International Journal of Recent Development in Engineering and Technology, 30-33.
- W.W., Busolo-Bulafu, C.M., vander Merwe, P.J.A. and Chancellor, T.C.B. (2002). Recommended groundnunt production practices for smallholder fermers in Uganda. UK natural resources institute .