BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

DESIGN AND CONSTRUCTION OF AN IMPROVED GROUNDNUT PASTING MACHINE

By

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A final year project report submitted in partial fulfillment of the requirement for the award of the Bachelor of Science in Agro Processing Engineering of Busitema University

DECLARATION

I **NETONDO VERONICA** declare to the best of my knowledge that this project report is as a result of my research and effort and it has never been presented or submitted to any institution or university for any academic award.

DATE ....17th May 2019.....

SIGNATURE .....

APPROVAL

This project report has been submitted to the department Chemical and Process Engineering for examination with approval from the following supervisor:

MR. ASHABAHEBWA AMBROSE

SIGNATURE: .....

DATE: .....

DEDICATION

I dedicate this work to my family members for their endless unconditional love and above all support they have given since the beginning of my education.

ACKNOWLEDGEMENT

Extreme thanks goes to the Almighty God for enabling me reach this far. I would like to give special thanks to my supervisor Mr. Ashabahebwa Ambrose for his wise suggestions, innovative ideas and whole-hearted help. And also special thanks go to the projects coordinator Mr. Sserumaga Paul and all my lecturers for their knowledge invested in me. Lastly, I extend thanks to all my fellow students for the love, unity and co-operation we have had during our stay at Busitema University.

May God bless you all.

ABSTRACT

Groundnut (Arachis hypogea) also known as peanut is one of the most important food crops grown and consumed in Uganda and other sub-Saharan countries **(Okello et al 2010a).** They are locally known as 'binyebwa' and is the second most important legume after beans in Uganda.

In the groundnut value chain, the pasting process is done using the groundnut pasting machines such as; the batch model pasting machines, hand operated groundnut pasting machine, among others though in some rural communities, the manual methods i.e the mortar and pestle and grinding stone are used for pasting groundnuts**(Pathak, 2017)**. Pasting is done as a means of adding value before selling or final consumption.

However, the existing machines have been rendered not efficient enough because they are mainly batch type and this consume a lot of time because the machine has to first be stopped in order for a ready batch to be emptied and another fed in and the generate a lot of heat due to the frequent switching off and on

Therefore, this study objective was to design and construct an improved groundnut pasting machine and and enhance quality production of paste. 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 73% efficient.

LIST OF ACRONYMS

UBOS - Uganda National Bureau of Standards

RPM – Revolution Per Minutes

FAO - Food and Agricultural Organization

UNIDO - United Nations Industrial Development Organization

FPMC- Food price management committee

HP- horse power

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CHAPTER ONE: INTRODUCTION

This chapter describes the background information, problem statement, justification, objectives and scope of the study. The problem statement describes the research problem and identifies potential causes and a solution. The justification describes the importance of the project. The specific objectives presented will achieve the main objective.

1.1 Background

In Uganda, groundnuts is one of the important legumes grown after beans **(Apalia *et al.*, 2006).** and its locally known as 'binyebwa' Groundnuts production serves two major purposes; house hold food and income generation. As food for households, groundnuts form part of the main components of the diet of most Ugandans. And they are mainly grown in Northern and Eastern part of the country **(Mohamoud et al., 1991).**

Of recent, new technologies and change of lifestyle by people, new groundnuts products such as groundnut paste, groundnut oil, groundnut cake, butter, peanut milk, among others have been introduced in the market. These new products are important in such a way that; *paste minimises the storage space due to its fine particles, applicability (multiple uses), groundnut paste possess unique flavor and taste which is desirable and appealing to consumers and not found in unpasted groundnuts. Roasting before grinding them enriches their nutritional and antioxidants profile.*

Table 1:Groundnut production (in shell) and acreage in Uganda, 2002-2010

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Production (mil. tons)	148	130	155	159	154	-	237	258	276
Acreage ('000 ha)	211	216	221	225	230	-	345	369	394
Productivity (kg/ha)	702	601	701	706	669	-	687	699	700

Source 1: USAID (2008); FAOSTAT (2011)

Before pasting the groundnuts, a number of operations are done to prepare them these processes include shelling, cleaning, sorting, roasting, blanching and pasting. **Pasting:** is the process of

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