BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANISATION AND IRRIGATION ENGINEERING

DESIGN AND CONSTRUCTION OF A DUO POWERED SHEA NUT GRINDING MACHINE

BY

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ABSTRACT

In Uganda, 80% of shea nut processing is done traditionally by pounding using mortars and grinding using stones. Also manual and electrical pressers are used on small scale which machines that are single powered that is electrical or manual. These machines are affected by load shedding and fatigue respectively. Thus a need to develop a dual powered shea nut grinding machine aiming at reducing the labour demand, improving efficiency, quality and to ensure consistency in production in case of load shedding.

The Introduction is a summary of the background of shea nut, the problem statement which includes the problems faced during shea nut grinding as one of the production process. The introduction also bears the justification of this project, the objective: both main and the specific objectives and the scope of this project.

Literature review contains the details of shea nut processing in Uganda, the numerous existing types of grinding machines with all their characteristics, the choice of the machine to be designed including the reasons for the choice of the design and the design methods that were used for this design.

Methodology contains the construction procedures, the materials that were used for the construction of the design, the design equations, the conceptual design structure, methods that were used to test for the grinding efficiency and capacity of both the manual and motorised system of the designed machine.

In Results and discussions, a duo powered machine was designed, constructed and tested for shea nut grinding efficiency and capacity was 69.3% and 5.7kg/hr respectively that was the motorized section and shea nut grinding efficiency and capacity was 71% and 2.28kg/hr respectively for the manually powered. During economic evaluation, the NPV = Ushs 4,349,280 is positive, meaning the project investment was viable. Further analysis shows that for every shilling invested, the return is Ushs11.12.

The appendix contains the engineering drawings and photographs of some activities involved during the construction of the prototype.

DECLARATION

I **ACOR NANCY NAUME,** do declare that this project report is my original work and has never been presented to any university or any other institution of higher learning for an award of a bachelor's degree.

Signature: .....Date: 30th - May - 2017

APPROVAL

This is to certify that this project report has been approved to be submitted for examination as a partial requirement for the award of the degree of **Bachelor of Agricultural Mechanisation and Irrigation Engineering of Busitema University.**

SUPERVISORS

DR MUSINGUZI WILSON BABU

SIGNATURE.....

DATE.....

MISS NAKABUNYE HOPE NJUKI

SIGNATURE.....

DATE.....

DEDICATION

I dedicate this project to my parents Mr Nyeko George David, Mrs Nyeko Margaret and Shalom International School (TESS) for all the financial, moral and spiritual support they have always offered to me whole heartedly to see me through in my education carrier. May God almighty reward and bless them abundantly!

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CHAPTER ONE: INTRODUCTION

Preamble

This chapter presents the general information about the research project giving its background, problem statement, purpose of the study, its justification, objectives, and study scope.

1.1 Background

The shea-nut is obtained from a shea tree (***Vitellaria paradoxa***) that grows naturally across nineteen countries of sub-Saharan Africa extending from Ethiopia to Senegal (***Akanji, 2012***). In Uganda the tree grows exclusively in the northern belt stretching from Acholi sub-region, through Lango sub region districts to the Karamoja and Teso sub-region (***Emasu, 2007***). The nuts are collected and processed by crushing and grinding to yield shea butter, which is widely used in soap, cosmetics, lotion, food preparation, chocolate manufacturing, ingredient in medicine, mosquito repellant and many other uses (***Carette et al, 2009***).

Out of the nuts gathered, 85% of this harvest is locally processed which yields between 15 – 80 million litres of oil using traditional methods (***Hatskevich, 2011***). Crushing of the nuts is done traditionally where shea nuts are collected and stored for extraction. The outer shells of the nuts are removed using either mortar and pestle or stones. The inner seed are pounded or grounded into a fine powder or paste in a wooden mortar. The existing machines for crushing the nuts locally are single powered either electrically or manually and in Uganda manual pressers are commonly used (***Okullo et al, 2008***). The oil extracted using this methods is very limited due to the inefficiency of the method employed. Furthermore, these production method are physically demanding causing fatigue and lack in quality and efficiency (***Beck et al, 2005***). Also production time is affected by load shedding for electrically powered machines therefore a dual powered shea nut grinding machine has to be developed. Currently, in East Africa, there is only one factory dealing in oil extraction from shea nut that is Guru Nanak oil mills in Lira district. This alone does not meet the ever increasing marketing opportunities for shea nut processed product in Uganda therefore there is a need for an intervention (***Ferris et al, 2001***).

In this research, a duo powered shea nut grinding machine will be studied as an eventual option for grinding shea nut instead of traditional methods currently being used with the aim of reducing the labour demand, improving efficiency, quality of grinding shea nut and to ensure consistency in production in case of load shedding.

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