BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN AND CONSTRUCTION OF A MOTORIZED MAIZE DEGERMER.

BY

OWOKWESIGA EMMANUEL

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EMAIL:emmadraxlergmail.com.

TEL:0780893586/0757032308.

SUPERVISOR: Mrs.KABASA SALLY MARRY.

final year project report submitted in partial fulfilment of the requirements for the award of the BSc. In Agro- processing engineering of Busitema University.

ABSTRACT

Cereal crops grown in Uganda include; maize, finger millet, sorghum, rice, pearl millet and wheat in that order of importance. Other than wheat, these crops provide staple food for well over 50% of the population (UBOS, 2010). According to report made by Bill & Melinda Gates Foundation (2014), Uganda was ranked as the 8th largest producer of maize in Africa and 3rd in East Africa. *Maize* is grown in most parts of Uganda but most intensely in eastern (Kapchorwa, Mbale, Kamuli, Jinja, Iganga), central (Masaka, Mubende) and western (Masindi, Kamwenge, Kyenjojo, Kasese, Kabarole) covering a total area of 1,014,260ha across the whole Uganda with 189,135ha in central, 388,762ha in Eastern, 247,780ha in Northern, 188,583 in western (UBOS, 2010)

maize is commonly consumed as either maize meal or maize flour but the most popular one is the maize flour. During the process of maize milling into maize flour the hull and germ are removed as maize bran leaving endosperm which is ground into maize flour. According to Heuze *et al.*(2015) Maize germ contributes about 11% of the kernel weight, contains 45-50% oil and about 85% of the oil kernel. The germ if wholly separated from endosperm and the hull, it can be further processed to produce high value products such as oil, oil meal, livestock feeds and fortification program. Therefore, there is a need to design and construct a motorized de-germing machine that will separate the germ wholly from the hull and endosperm so that it can be used for further processing.

Different components of the machine were designed basing on the physical, mechanical and chemical properties of the maize, the components include; the feed hopper, crushing rollers, shaft and abrasive disks, main frame, driving mechanism and analyzing forces acting on the components to prevent failure. The machine uses a total maximum power of 7.5HP, after fabrication, the performance and economic analysis of the machine were performed in terms of extraction efficiency of 54.5%. Machine's total cost; Ugx.2.08M, and its Net present value is 701240830.2, since its greater than 0, the project is viable, Owing to the performance and economic analysis of the machine, it achieves all its design purposes hence it is recommended for commercialization and adoption by the target groups.

DECLARATION

I **OWOKWESIGA EMMANUEL** 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 of Chemical and process Engineering for examination with approval from the following supervisor:

Mrs. KABASA SALLY MARY.

SIGNATURE .....

DATE.....

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1 CHAPTER ONE: INTRODUCTION

1.1 Background

Cereal crops grown in Uganda include; maize, finger millet, sorghum, rice, pearl millet and wheat in that order of importance. Other than wheat, these crops provide staple food for well over 50% of the population (UBOS, 2010). According to report made by Bill & Melinda Gates Foundation (2014), Uganda was ranked as the 8th largest producer of maize in Africa and 3rd in East Africa. *Maize* is grown in most parts of Uganda but most intensely in eastern (Kapchorwa, Mbale, Kamuli, Jinja, Iganga), central (Masaka, Mubende) and western (Masindi, Kamwenge, Kyenjojo, Kasese, Kabarole) covering a total area of 1,014,260ha across the whole Uganda with 189,135ha in central, 388,762ha in Eastern, 247,780ha in Northern, 188,583 in western (UBOS, 2010). Over 90% of Uganda's maize is produced by smallholder farmers (SHFs), of which about 60% of the annual maize output is consumed on the farm, 22% is exported mainly to Kenya, S. Sudan, Rwanda, Burundi and Congo. Inefficient storage and drying practices lead to 15%post-harvest losses and low quality. Different varieties of maize grown in Uganda include; White star,Kawanda Comp A., Longe 1, Longe 4 (LP 16), Myezi Mitatu(MM3), Longe 5 D, UH 5402 (Tasai, 2016). Maize can be consumed on cobs, which are either cooked or roasted. Maize can also be dried and then milled into maize flour which can be used to prepare a local paste called posho, demand for which is on the increase. Maize flour is also used in making porridge for breakfast in many homes in urban areas while the maize itself is used in the manufacture of feeds for livestock. Maize is also a good source of starch and oil (NARO, 2015). Globally, maize is a staple crop, and many people rely on it as a primary source of nutrition and its deficiency in the diet can lead to malnutritional diseases like marasmus.According to (Kasooha, 2013) 60% of children below five years die annually in Uganda as a result of malnutrition, he further indicated that 45% of children in Karamoja are affected by malnutrition while in the western region it stands at 44%.

There are two distinct techniques that are used to process corn: wet milling and dry milling.Corn wet-milling is a process where components of corn kernels are extracted to produce a highly purified product. Most of the products from this process are valuable and mainly required by the food industry. Dry Milling processors produce starch for ethanol and other products, while valuable by-products for use in animal feeds. From a processing perspective, the maize kernel is

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