BUSITEMA UNIVERSITY
Pursuing Excellence

BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF AGRO PROCESSING ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN AND CONSTRUCTION OF A MULTI GRAIN CLEANER

BY

SSENGABI ALEX
BU/UG/2010/107
ssengabialex@gmail.com, +256 784429193

SUPERVISORS: Dr. Catherine Wandera
Mr. Andama Otubo

A final year project report submitted to the Faculty of Engineering as a partial fulfillment of the requirements for the award of a Bachelor of Science degree in Agro-Processing Engineering

JUNE 2014

ABSTRACT

Rice and maize, contribute an important element in food industry and food security in Uganda. Grains are consumed in homes, schools, hospitals, among the armed forces, rehabilitation centers, refugee camps institutions, health centers due to the large quantity of carbohydrates, proteins, vitamins and fats contained in the kernels. According to FAO, 1994 , 10% grain losses occur due to poor post-harvest handling .Harvested grains have straw, chaff, sand, rocks, dust, damaged seed , stones ,cobs husks and many others. The foreign matter in grains adversely affects subsequent storage and processing conditions affecting the nutritional and market value. Cleaning by traditional winnowing technology leaves the grain contaminated with foreign matter posing a reduction in farmer's income

Smallholder farmers in Uganda use traditional post-harvest handling methods that expose grain to contamination by foreign matter. Manually grain cleaning methods are inefficient, labor intensive and depend on natural wind which leaves the grain contaminated.

To overcome this problem, this study chose as its main objective to design and construct a multi grain cleaner as well as testing of the constructed machine and the economic evaluation of the multi grain cleaner. It is aimed to enable the small holder farmers to enhance the quality and quantity of their consumable grain and enhancing the nutritional and market value, with significant reduction in the quantitative post-harvest losses thus enhancing the country's food security status. The grains considered in this study were rice and maize

Various components of multi grain cleaner were designed using basic engineering principles and some physical properties of grains such as size, density, (760kg/m^3,), moisture content, (7.6% dry basis), angle of repose, (28) and weight of the grain. The trays, sieves perforations were obtained to be 11mm and 6.0mm for first and second sieves respectively.

The performance of multi grain cleaner was evaluated in terms of machine output, cleaning efficiency, cleaning loss and mechanical damage for machine output and found as 748.44kg/hr, 74%, 7.54% and 2.275% respectively.

Key words: multi grain, cleaning, stratifying efficiency, cleaning output, density, size, chaff, contaminants

ACKNOWLEDGEMENTS

I thank the almighty Lord for His loving kindness and providing me exceedingly abundantly more than I can ever ask or imagine. To Him be the glory power, worship, honor and praise.

My gratitude and deep appreciation to my supervisors Dr. Catherine Wandera and Mr. Andama Otubo for their invaluable guidance , comments , suggestions ,criticisms and friendship throughout my research

Deserving no less gratitude are the different lecturers of Department of APE, for their technical assistance during the project.

I also acknowledge the APE students for the help rendered unto me during my study period

Special mention, deep appreciation and thanks to my mother Miss Nanfuka Magret without her toil, devotion, sacrifice and encouragement, I would not be whom I am

DECLARATION

I **SSENGABI ALEX** hereby declare that the information presented and submitted in this final year report to the department of Agro Processing Engineering Busitema University is entirely original, was done and researched by myself and has never been submitted to any other institute for any award.

NAME: SSENGABI ALEX.

REGNO: **BU/UG/2010/107**

SIGNATURE: .....

APPROVAL

This final year project report writing has been under my supervision. I have read and checked the report. I therefore approve it for submission.

Name: Dr. Catherine Wandera

Designation: Main supervisor

Signature .....

Date 25/06/2014

Name: Mr. Andama Otubo

Designation: Co. Supervisor

Signature .....

Date 25/06/2014

LIST OF ACRONYMS

MAAIF	Ministry of agriculture animal industry and fisheries
FAO	Food and Agriculture Organization
KCCA	Kampala Capital City Authority
USD	United States Dollar
CAD	Computer Aided Drawing
HP	Horse Power
UNBS	Uganda National Bureau of Standards

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS

Contents

CHAPTER ONE

1.0 INTRODUCTION

This chapter provides a background of the study, problem statement, justification, objectives and scope of the study.

1.1 Background of the Study

The grains that are commonly produced and consumed in Uganda include: rice, maize sorghum, millet. Particularly production, processing and trade in these grains largely contribute an important element in the food industry and the food security situation in the country. Rice and maize are largely consumed in homes, schools, hospitals, among the armed forces, rehabilitation centers, refugee camps institutions, health centers and they are the focus grains in this study.

In Uganda, rice farming in lowland areas using traditional or improved gravity irrigation facilities is established in various rice growing areas, namely: Doho rice scheme in Butelejadistrict, Olwenyrice scheme in Lira district and the Kitgum rice scheme in Agoro Sub County (MAAIF, 2006).Kibimba (Tilda) rice scheme (MAAIF, 2007) was established in 1966 by the then government of Uganda with the objective of reducing expenses on food imports (Bigirwa*et al,* 2005). Today rice has become a major food security crop as well as a cash crop in a number of Uganda's districts and its adoption is increasing. The traditional rice growing districts of Uganda include: Bugiri, Tororo, Iganga, Palisa, Lira, Amuru, Gulu ,Kitgum and Pader in Eastern and Northern Uganda and Hoima, Kibaale, Masindi, Bundibugyo, Kabarole, Runkungiri, Kanugu and Kamwenge in Western Uganda,and Luweero, Nakaseke, and Wakiso in Central Uganda; (MAAIF, 2006). Rice is particularly being promoted across the country by the government as a rural poverty alleviation crop. Total rice consumption is estimated at 225,000metric tons yet population growth rate is 3.2% thus the demand for rice is expected to rise (UBOS, 2009).Oryokot*et.*al (2004), reports that by 2004, Uganda's rice imports stood at about 45,000 metric tons. The rice production levels in terms of both area and quantity of paddy is rising steadily.

REFERENCES

Adewumi, B. A., O. C. Ademosun and A. S. Ogunlowo. 2006. Preliminary investigation on the distribution and spread pattern of cowpea in a cross flow grain separator. *Agricultural Engineering International: the CIGR E journal.* Manuscript FP 06 020. Vol III.

Agricultural Engineers Year Book (1978-80). Published by the American Society of Agricultural Engineers, Twenty-sixth edition. Pp 352-355.

Aguirre, R. and A. E. Garray. 1999. Continuous flowing portable separator for cleaning and upgrading beans seeds and grains. *Agricultural Mechanization in Asia, Latin America and Africa* 30 (1): 59-63

Joseph Edward Shigley, (1986), Mechanical Engineering Design. First Metric Edition, McGraw-Hill

Beck, F and H. D. Kutzbach. 1996. Computer simulation of grain/chaff separation on grain pan and cleaning shoe of the combine harvester. ASAE paper 961051. St Joseph, M.I.USA

Elfverson, C. and S. Regner. 2000. Comparative precision of grain sieve and pneumatic classification on a kernel level. *Applied Engineering in Agriculture* 16 (5): 537-541.

Feller, R. and A. Foux. 1975. Oscillating screen motion effect on the particle passage through perforations. *Transactions of the ASAE* 18 (5): 926-931..

Harrison, H. P. and A. Blecha. 1983. Screen oscillation and aperture size- sliding only. *Transactions of the ASAE* 26 (2): 343-348.

Henderson, S. M., R. L. Perry, and J. H. Young. 1997. *Principles of Process Engineering.* 4th Edition. ASAE. Michigan, USA. pp 280-283.

Conference on Crop Harvesting and Processing. Kentucky USA. ASAE Publication Number 701P1103e. St Joseph, Mich. ASAE. 22 Pp .

Hopfen, H. J. 1969. Farm implement for arid and tropical regions. Agricultural Development Paper No 91. FAO Rome.

Lee, J. H. A. and R. G. Winfield. 1969. Influence of oscillating frequency on separation of wheat on a sieve in an air stream. *Transactions of the ASAE* 12(3): 886-888.