



**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**FACULTY OF ENGINEERING**

**DEPARTMENT OF AGRICULTURAL MECHANIZATION & IRRIGATION  
ENGINEERING**

**A FINAL YEAR REPORT**

**RE-DESIGN AND FABRICATION OF A RICE DESTONER**

**BY**

**NAME: NDEMA HABIB**

**REG: BU/UG/2014/3**

**Email: [carterreigns@gmail.com](mailto:carterreigns@gmail.com) and Tel: +256757350788**



**PROJECT SUPERVISORS**

**MISS NABATEREGA RESTY**

**ENG. SSAJJA SSALI GODFREY**

*A final year project proposal report submitted to the Department of Agricultural Mechanization and Irrigation engineering in partial fulfillment for the award of the Bachelor of Science in Agricultural Mechanization and Irrigation degree of Busitema University,*

**MAY 2018**

## **ABSTRACT**

Rice is the second highest worldwide production after maize (FAO, 2004) . Rice is a well-known tropical cereal considered to be a major food item because its nutrients encompass the entire (carbohydrate) fattening intake of mankind. (BABATUNDE, 2004)

The rice produced by Ugandans is 6.1 % contaminated with foreign material (Tokida, 2014) which mainly constitutes of soils and stones mainly brought about by the post-harvest processes involved in rice processing from paddy.

About 80% of rice in Uganda is produced and milled by small-scale farmers using cottage mills. The milled rice is of low quality and competitiveness on market is affected. This is because small scale farmers harvest and thresh paddy using rudimentary methods during which paddy is exposed to soil and stones.

Rice is grown in all regions of Uganda. It's grown in the districts of Hoima, Masindi in the western, Lira, Gulu in the north, Nakaseke, Wakiso in the central and Butaleja, Paliisa, Namutumba in the eastern and many other districts (Tokida, 2014).

This is a 10-months' project limited only to design, construction, testing and economic evaluation of rice de-stoner for the small-scale rice production Uganda.

### **Acknowledgements**

I gratefully acknowledge Oguma Norman ,Wataka Emma and Igira Ezedekia for the continuous support rendered to me during the project fabrication and the University of Busitema for allowing us to get engaged in transferring class work into practical work with the aim of solving problems affecting the society I am also particularly grateful to Eng. Wilfred Odogola for providing me with the skills to carry out this research at university graduate level.I also want to thank Mr. Ashabahebwa Ambrose for the guidance and support given to me towards the completion of the project.

The practical assistance of the technical staff was extremely valuable. Acknowledgement also is made to the assistance given by the engineers at TONNET AGRO INDUSTRIES LIMITED who helped me with information related to this report.

Finally, special acknowledgment is made to my parents and other family members for their understanding, unfailing help and spiritual support, without which this work would never have been completed.

## Table of Contents

ABSTRACT.....	i
Acknowledgements.....	ii
Declaration.....	iii
Approval .....	iv
1 CHAPTER ONE: INTRODUCTION.....	1
1.1 Background of the study .....	1
1.2 Problem statement.....	2
1.3 Justification .....	3
1.4 Main objective.....	3
1.5 Specific Objectives.....	3
1.6 Scope of the Project.....	3
2 CHAPTER TWO: LITERATURE REVIEW .....	4
2.1 Harvesting .....	5
2.1 Drying practice.....	5
2.2 Paddy cleaning practices .....	6
2.3 Rice milling technologies.....	6
3 CHAPTER THREE: METHODOLOGY .....	7
3.1 Design considerations .....	7
3.2 Machine description .....	7
3.3 Working mode of the machine.....	8
3.4 Drawings of the rice destoner.....	8
3.5 Design of the parts of the destoner.....	11
3.5.1 Design of hopper.....	11

3.5.2	Chaff Blower.....	12
3.5.3	Determination of the power required for driving the blower.....	14
3.5.4	Design of a vibrating sieve .....	15
3.5.5	Design of the cam .....	16
3.5.6	Design of the reciprocating shaft.....	17
3.5.7	Design of the stand.....	20
3.5.8	Design of the pulley .....	21
3.5.9	Belts design.....	22
4	CHAPTER FOUR: RESULTS AND DISCUSSION.....	24
4.1	Construction and fabrication of the machine .....	24
4.2	Material selections.....	24
4.3	Fabrication of machine components .....	24
4.3	Fabrication processes .....	27
4.3.1	Welding process.....	27
4.3.2	Machining process .....	28
4.3.3	Casting of components.....	28
4.4	Testing methods of the prototype.....	28
4.4.1	Destoning capacity.....	29
4.4.2	The destoning efficiency.....	29
4.4.3	The amount of stones in the rice .....	29
4.4.4	The losses due to the chaff blower.....	29
4.5	Testing procedure.....	30
4.6	ECONOMIC EVALUATION OF THE MACHINE.....	32
4.7	Discussion .....	35

5	CHAPTER FIVE .....	36
5.1	CONCLUSION .....	36
5.2	RECOMMENDATIONS .....	36
6	References .....	37

Table of figures

Table 1:	Shows rice varieties in Uganda.....	4
Table 2:	shows chaff blower specifications .....	13
Table 3:	shows Air separator blower specifications .....	15
Table 4:	shows mechanical properties of steels.....	21
Table 5:	shows belt specifications .....	23

# 1 CHAPTER ONE: INTRODUCTION

## 1.1 Background of the study

Rice is the second highest worldwide production after maize (FAO, 2004). Rice is a well-known tropical cereal considered to be a major food item because its nutrients encompass the entire (carbohydrate) fattening intake of mankind (BABATUNDE, 2004).

Rice is the second highest worldwide production after maize (FAO, 2004). It is the most important staple food for a large part of the world's human population especially in Asia and West Indies and a backbone for the rural population and their food security. It is vital for the nutrition of much of the population in Asia, Latin America, and the Caribbean as well as in Africa; (FAO, 2004). It is central to the food security of over half of the world population. Reducing rice post-harvest losses is a necessary step toward ensuring greater global food security as increased future demand will require increased production efficiency. Developing countries account for 95% of the total production, with China and India alone responsible for nearly half of the world output (FAO, 2004) which indicates the importance of rice economically (financially) therefore availability of rice processing machines is an important virtue to food production in Uganda. Increasing food quality is a necessary step towards the entire world's food security due to the drastically increasing population which does lead to increased demand.

Rice is mainly cultivated by small farmers in holdings of less than 1 hectare (Wilfred, 2006). It is also a wage commodity for workers in the cash crop or non-agricultural sectors. In the past three decades in Africa the crop has seen consistent increase in demand and its growing importance is evident in the strategic food security planning policies of many countries (Wimberly, 1983). With the exception of a few countries that have attained self-sufficiency in rice production, rice demand exceeds production and large quantities of rice are imported to meet demand at a huge cost in hard currency (FAO, 2004) Africa's inability to reach self-sufficiency in rice is the result of several major constraints in the rice industry which require urgent redress to the system. The trend of overreliance on imports to satisfy the increasing demand for rice in areas where the potential of local production resources is exploited at very low levels.

## 6 References

- Adegun, I. (2006). Development of corn and rice mixture separation machine. *Development of guinea corn and rice mixture separation machine*, 7.
- Agricultural engineering international. (2008). Investigating Grain and cleaning efficiency.
- BABATUNDE. (2004). *Design and Construction of Motorized Rice Threshing Machine*. MINNA.
- Childs, P. (2004). *Mechanical Design, Belt and chain drives*. Oxford: Elsevier Butterworth\_Heinemann.
- Consult, S. (2012). *subsector analysis report; Rice [grain & seed]*. Kampala.
- FAO. (2004). *Strengthening farm-agribusiness linkages in africa*. (A. Rottger, Ed.) ROME: FAO.
- McGraw Hill, J. E. (2001). *Mechanical Engineering Design, 6th edition*. New York.
- Moth, R. L. (2008). *Machine elements and Mechanical Design 2nd edition*. New York: Macmillan publishing company.
- Okunola, A. J. (2009). *development of a reciprocating sieve and air blast cereal cleaner*. lagos.
- Tokida, K. (2014). Evolution and Prospects of the rice mill industry in uganda. 14.
- Waterman, N. (2001). *The selection of materials engineering design guide*. oxford: university press UK.
- Wilfred, O. R. (2006). *Final survey on the status of rice production, processing and marketing in Uganda*. Kampala.



Wimberly, J. E. (1983). *Technical Handbook for the Paddy Rice Postharvest Industry in developing countries*. MANILLA: International Research Institute.