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**FACULTY OF ENGINEERING
DEPARTMENT OF AGRICULTURAL MECHANIZATION AND
IRRIGATION ENGINEERING
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ENGINEERING**

**DESIGN AND CONSTRUCTION OF AN IMPROVED MOTORIZED
SORGHUM THRESHER**

BY

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the Degree of Bachelors in Agricultural Mechanization and Irrigation engineering of
Busitema University.*

MARCH 2022

DECLARATION

I **NAIGAGA MIRIA** solemnly declare to the best of my knowledge that the piece of this Project report is as a result of my research and effort and it has never been submitted or presented to any University, College or any other Institution for an academic award.

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APPROVAL

This Final Year Project report is submitted to the department of Agricultural Mechanization and Irrigation Engineering of Busitema University for examination with approval of my supervisor

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SIGNATURE.....

DATE.....

DEDICATION

This report is dedicated to my beloved guardian **Mr. Mwambu Paul**, my parents **Mr. Abalyekoba Moses** and **Mrs. Musuya Tabitha**, not forgetting **Mr. Oburu Richard** in appreciation for their selfless care and parental support provided to me since childhood, and for the mentorship of hard work and determination delivered to me, - which attributes I have cherished with firmness and which have transformed me to this level.

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May the ALMIGHTY GOD Bless you abundantly

LIST OF ABBREVIATIONS

- ASTM** - American Society for Testing and Materials
ASME - American Society of Mechanical Engineers
EAC - East African Community
ASFC - Appalachian Staple Food Collaborative
FAO - Food and Agriculture Organization
Ha - Hectares
HP - Horse Power
MAAF - Ministry of Agriculture Animal and Fisheries
Mt - Metric tones
MS - Mild Steel
UEPB - Uganda Export Promotion Board
USD - United States Dollars
UBOS - Uganda Bureau of Statistics
PV - Present Value
NPV - Net Present Value.

LIST OF FIGURES.

Figure 1 Shows stick beating method of sorghum threshing.....	6
Figure 2. Shows Manually operated sorghum thresher	7
Figure 3 Shows winnowing of threshed sorghum by natural wind.	9
Figure 4. Shows set up of sieve reciprocating mechanism	11
Figure 5 Shows design drawing of the peddle thresher	11
Figure 6 Peddle Thresher with a Blower and the front and elevation of the machine.....	12
Figure 7: Self-Propelled Combine thresher	13
Figure 8:Shows the conceptual diagram of the machine.	16
Figure 9: Shows operational sequence of the sorghum thresher.....	17
Figure 10. Shows the arrangement of the belt on pulleys.....	21
Figure 11. Shows tension on the belt.....	22
Figure 12. Shows the grain collection chamber.....	23
Figure 13. Shows the hopper shape	27
Figure 14. Shows the speed power capabilities for leather v-belt.	35
Figure 15 Assembled improved motorized Sorghum threshing Machine.	44
Figure 16. Graphical Representation of the Test Results	46

LIST OF TABLES.

Table 1. Shows sorghum growing conditions in different regions of Uganda.	4
Table 2. Shows Common Sorghum varieties in Uganda.	5
Table 3 Advantages and disadvantages of Stick beating method	7
Table 4. Shows the Selection criteria and possible materials used:.....	24
Table 5: Shows the Operations, methods and processes that were involved during fabrication..	25
Table 6. Physical and mechanical properties of sorghum grains.....	27
Table 7. Shows design calculations and results for the threshing unit.	28
Table 8. Shows design calculations and results for the blower.	30
Table 9. Design Calculations and results for the cleaning sieve mechanism.	32
Table 10. design Calculations and results for the driving Mechanism	32
Table 11. Shows design Calculations and results for the threshing rotor.	35
Table 12. Shows the design Calculations and results for the Frame.	39
Table 13: Shows the Fabrication procedures of parts.....	41
Table 14. Quantities Measured during Testing of the Machine.....	45
Table 15. Shows the Performance Evaluation of the Machine	46
Table 16. Shows the Project budget.....	47
Table 17. Show Netbook value Calculations	49
Table 18. Shows the Cost analysis of the machine.	49

TABLE OF CONTENT

DECLARATION	i
APPROVAL	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
LIST OF ABBREVIATIONS	v
LIST OF FIGURES.	vi
LIST OF TABLES.....	vii
TABLE OF CONTENT	viii
ABSTRACT.....	xii
CHAPTER ONE. INTRODUCTION.....	1
1.1 Background of the study	1
1.2 Problem statement.....	2
1.3 Justification of the study.	2
1.4 Objectives of the study.....	2
1.4.1 Main objective.	2
1.4.2 Specific objectives.	2
1.5 Significance of the study.....	2
1.6 Scope and limitation of the study.....	3
CHAPTER TWO: LITERATURE REVIEW	4
2.1 Sorghum production and trends in Uganda.....	4
2.1.1 Sorghum varieties grown in Uganda.....	4
2.1.2 Major producing sorghum regions in Uganda.	5
2.2 Utilization and physical properties of sorghum.	5
Utilization of sorghum.....	5

2.2.1	Physical properties of sorghum.....	6
2.3	Sorghum threshing operations.....	6
2.3.1	Traditional threshing operations.	6
2.3.2	Mechanical threshing Methods.....	7
2.4	Winnowing and cleaning Operations.	8
2.4.1	Sieve method.....	8
2.4.2	Using natural wind method.....	8
2.5	Existing sorghum threshing Mechanisms/machines.	9
2.5.1	The concave drum clearance mechanism	10
2.5.2	Sieve reciprocating mechanism	10
2.5.3	Peddle thresher.....	11
2.5.4	Self-propelled combine thresher.	13
CHAPTER THREE: METHODOLOGY		15
3.1	Introduction.	15
3.1.1	Working principle of the improved motorized sorghum thresher	16
3.1.2	Design Considerations/Specifications.	17
3.2	DESIGN OF MACHINE COMPONENTS.	17
3.2.1	The Hopper.	17
3.2.2	Design of the shaft.	17
3.2.3	Design of the screw conveyor on the pipe.	19
3.2.4	Design of Shaking sieve.....	20
3.2.5	Design of the Concave sieve.....	20
3.2.6	Design of the blower and the blower Housing.....	20
3.3	The driving mechanism.....	21
3.3.1	Sizing of Pulley.....	21

3.3.2	Selection of the Belts	21
3.4	Total power requirement of the machine.	22
3.4.1	Power requirement for shaking mechanism, (P_s).....	22
3.4.2	Power required to thresh the sorghum . (P_t).....	23
3.5	Design of the main frame.	23
3.6	Design of the sorghum collection chamber.....	23
3.7	Fabrication of the sorghum thresher.....	23
3.7.1	Material Selection Creteria	23
3.7.2	Tools, Equipment and Machines to be used.	25
3.8	Testing the Performance of the Proposed Prototype.....	25
3.8.1	Threshing efficiency, TE(%)	25
3.8.2	Cleaning efficiency, CE(%).....	25
3.8.3	Percentage of damaged grains, Pb	25
3.9	Economic evaluation of the improved sorghum thresher.....	26
3.9.1	Total initial investment of the thresher.	26
3.9.2	Net present value (NPV) method.....	26
CHAPTER FOUR: RESULTS AND DISCUSSIONS.....		27
4.1.	DESIGN CALCULATIONS FOR THE IMPROVED SORGHUM THRESHER.	27
4.1.1	The hopper.....	27
4.1.2	The threshing Unit.....	28
4.1.3	Design of the blower Simolowo <i>et at.</i> ,(2004).....	30
4.1.4	Selection of Cleaning sieve.....	31
4.1.5	Driving mechanism.....	32
4.1.6	Threshing Rotor shaft design.....	35
4.1.7	Frame Design.....	39

4.2	FABRICATION AND ASSEMBLY OF MACHINE COMPONENTS.	40
4.2.2	The improved motorized sorghum threshing machine after fabrication, assembling and painting.	44
4.3	PERFORMANCE EVALUATION OF THE MACHINE.....	45
4.4	ECONOMIC EVALUATION OF THE IMPROVED SORGHUM THRESHER.....	47
4.4.1	Investment cost.	48
CHAPTER FIVE: RECOMMENDATIONS AND CONCLUSIONS		50
5.1	CONCLUSION.....	50
5.2	RECOMMENDATIONS	50
REFERENCES		51

ABSTRACT

Sorghum is one of the most important and second cereal grown in Uganda just after maize. Despite the high level of production of sorghum in Uganda, its threshing and cleaning operations remain among the major challenges especially to farmers in the Eastern and Northern region of the country. To overcome those challenges, locally made sorghum thresher were designed and fabricated but still they are associated with many problems like low capacity of production, high scatter losses, contamination of cleaned grain with chaff (chaff outlet and clean grain outlet face the same direction) and mechanical grain damage. To solve the problems, I developed an improved motorized sorghum thresher to thresh, separate and clean Sorghum. The major components of the machine include the hopper, threshing rotor (central shaft, feeder conveyor, L- beaters on a cylindrical pipe), concave sieve, frame, driving mechanism, top cover, blower, shaking mechanism (four rubber hinges and cleaning sieve). The threshing action is achieved by parallel L-type round beaters arranged in helical form stripping the sorghum from the stalks as it passes between the revolving rotor and a concave sieve and this is based on a combination of impact, compression and shear force created in the threshing chamber. The grains are further separated by the blower fan which blows a column of air horizontally past the grains that drop vertically on a shaking sieve and force the chaff through the chaff- discharge outlet. The machine was designed to be powered by a 4hp electric motor. Performance tests were further done, achieving average threshing, cleaning efficiencies and mechanical grain damage of 79.9%, 57.8% and 8.3% respectively at average feed rate of 0.006Kg/h and moisture content of 14% dry basis. The machine throughput capacity was also computed and found to be 101Kg/h. It was observed the Moisture content, federate and speed are highly significant on throughput capacity, mechanical grain damage and scatter losses. Therefore, the designed and constructed improved motorized sorghum thresher increased the sorghum output, reduced contamination of the grain and drudgeries which led to production of good quality sorghum that can easily be stored for long and fetch high prices.

Keywords: Sorghum, moisture content, grain, chaff, efficiency, improved.

CHAPTER ONE. INTRODUCTION

1.1 Background of the study

Sorghum is one the important cereals grown in **Uganda**. It's the second cereal grown in Uganda just after maize in the case of production with an **area of coverage (UBOS, 2010)**. This is due to the fact that the crop is highly commercialized in the brewing value chain and what is grown for this purpose are the improved varieties from the National Semi Arid Resources Research Institute of the National Agricultural Research Organization (**Lubadde Godfrey et al, 2019**)

Statistics in Uganda show that there is a difference in sorghum productivity in the different regions of Uganda for example in Western (1.4kg/ha), Eastern (1.3kg/ha), Central (1.2kg/ha), Northern (0.7kg/ha), (**Lubadde Godfrey et al, 2019**). The same statistics gives the percentage of sorghum production by each region in Uganda where Northern region ranked the best followed by Eastern region, Southwestern region and Central region.

In Uganda, small and medium -scale farmers still use the traditional methods of threshing sorghum (Stick beating) and manual winnowing methods (**Lubadde Godfrey et al, 2019**). This leads to increased Production of broken grain due to uncontrolled beating and contaminated grain with soils, sands, stones and metals which lowers their quality. Also manual winnowing is highly tedious, exposes farmers to ill health due to dust inhalation, wastages due to incomplete removal of threshed grains from the extragenous matter, drudgery.

There are some machines that can be employed to thresh sorghum but they have limiting factors like low output capacity, high scatter losses, contamination of cleaned sorghum with chaff and mechanical grain damage.

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