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**FACULTY OF ENGINEERING**

**DEPARTMENT OF AGRICULTURAL MECHANIZATION AND  
IRRIGATIONENGINEERING**

**DESIGN AND CONSTRUCTION OF A MAIZE COB  
MILLING MACHINE**

**By**

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of the degree of bachelors of agricultural mechanization and irrigation engineering*

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## DECLARATION

I, SAKKA RONALD do hereby declare that this proposal report is my own original work and that; it has not been published and/or submitted for any academic award to any higher institution of learning. All the work contained in this report is as a result of my research except where cited.

SAKKA RONALD

Date: 25/05/2015

*Sakka Ronald*



## DEDICATION

I dedicate this project Report to BRIAN STEIN for the wonderful work done towards reaching this level of education. May the almighty God bless him abundantly.

I also dedicate it to my mum kayaga Rosette and Mr. Bazira Gerald for the sacrifices, time and courage you provided me which have enabled me to complete this course. Thank you for the spirit of hard work, courage and determination you have instilled in me throughout my school days until today.

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## ABSTRACT

Maize cob is one of the agricultural wastes from the maize crop; among others include maize stalk and leaves which are being used as a source of organic manure and at times as animal feeds. Maize cobs can be used as roughages that become available as livestock feeds after the crops have been harvested. Maize cobs have got some minerals and nutrient such as proteins, edible fibre, calcium, potassium, chlorine, cellulose and many others. In Uganda, the increase in the price of maize due to high demands and exportation to outside countries like Sudan, has resulted into high increase in the prices of animals feeds majorly maize bran hence making animal rearing very expensive. The aim of this study was to make use of the available nutrients and minerals found in a maize cob to supplement animal feeds. This was be attained through the design and construction of a maize cob milling machine powered by a motor. In achieving the above goal, basic engineering principles, physical and mechanical properties of maize cobs were considered in the design of the various components of the maize cob milling machine. The machine was designed basing on the crushing speed of maize cobs which ranges between 800 to 1400rpm, crushing force of 860N and crushing strength of 5.4MPa. Softwares such as solid edge, AutoCAD and Matlab were used in the design of the intended machine. The machine was fabricated from readily available materials and common production technologies, including cutting, bending, welding, drilling, milling and others. The maize cob milling machine was designed and constructed by first sizing of the components through analysis of forces acting on the components, material selection, fabricated and assembled. The selected materials were those which would withstand the applied forces in order to avoid failure of the components during operation of the machine. After the fabrication process the machine was tested for its performance.

A summary of the key findings included, the designed machine could be operated by at least a 3hp motor. The cost of prototype was UGX 600000 .After testing, the machine had a production capacity of 7kg/hr. of maize cobs with an average efficiency of 84%. The percentage loss was 16% .Provisions was provided to change the sieve in case certain sizes of maize cobs were required. The prototype had a limitation of producing a

lot of noise and dust when operating. Conclusions and recommendation about the project are also included in this report.

## ABBREVIATIONS AND ACRONYMS

ILRI -International Livestock Research Institute

HP-horse power

RPM-revolution per minute

Pa -Pascal

Rad -radians

N- Newton

UGX-Ugandan shillings

eqn- Equation

## TABLE OF CONTENT

DECLARATION.....	i
APPROVAL .....	ii
DEDICATION .....	iii
ACKNOWLEDGEMENT .....	iv
ABBREVIATIONS AND ACRONYMS .....	vii
1.1 BACKGROUND OF THE STUDY.....	1
1.2 PROBLEM STATEMENT .....	2
1.3 JUSTIFICATION.....	3
1.4 SCOPE OF THE STUDY.....	3
1.5 OBJECTIVES.....	3
1.5.1 Main objective.....	3
1.5.2 Specific objectives.....	4
1.6 ACTIVITIES THAT WERE PERFORMED DURING THE PROJECT DESIGN.....	4
CHAPTER II: LITERATURE REVIEW.....	5
2.1 Descriptions of the maize plant, maize seed and the maize wastes.....	5
2.2 Agricultural waste and the environment.....	6
2.3 The maize cob morphological structure.....	6
2.4 Structure of a cob and its parts.....	6
2.5 Existing research about the use of maize cobs as feeds.....	7
2.5.1 Other uses of maize cobs.....	8
2.5.2 Improving nutritive value of cobs powder.....	8
2.6 Challenges associated with maize cobs.....	9
2.7 Cob processing and usage practices.....	9
2.8 Existing maize cob milling technology.....	10
2.9 Poultry farming in Uganda.....	10
2.10 Piggery farming in Uganda.....	11
2.11 Minerals or nutritive elements found in maize cob.....	11
2.12 Background of the machine Components in relation to maize cob milling machine.....	13
2.13 Mechanical properties of the maize cob.....	14
2.14 Crushing speeds for maize cobs.....	15



2.15 particle size reduction methods .....	15
<b>CHAPTER III: METHODOLOGY .....</b>	<b>17</b>
3.1 Desk study .....	17
3.2 Design parameters .....	17
3.3 General design considerations.....	18
3.4 Conceptual machine design .....	18
3.4.1 Machine description .....	19
3.4.2 Operation of the machine.....	19
3.4.3 Estimation the capacity of the machine .....	20
3.5 Determination of the Power required by the Machine.....	21
3.6 Determination of the power of the scaled down machine .....	24
3.6.1 Calculating the power for crushing 5kg of maize .....	24
3.6.2 Calculating the power requirement for rotating the hammers.....	24
3.7 Determination of the dimensions of the hammers .....	26
3.8 Shaft design .....	27
3.8.1 Bearing selection.....	33
3.8.2 Key design.....	34
3.9 Torque on the shaft.....	35
3.10 Rubber Belt drive selection.....	36
3.11. Design of the pulley system .....	36
3.12. Determination of approximate length of the Belt.....	38
3.12.1Determining the number of belts using belt tensions .....	40
3.12.2 Determining the number of belts using correction factors .....	41
3.13: The torque transmitted by the motor .....	43
3.14 Design of the hopper.....	44
3.15. Machine Frame.....	46
3.16 General Selection of materials .....	49
3.17 Construction of the machine .....	50
3.18 Testing of the machine.....	53
<b>CHAPTER FOUR: RESULTS AND DISCUSSION .....</b>	<b>55</b>
4.1 Designed parameters of the different parts the machine .....	55
4.2 Material section .....	55

4.3 Fabrication and assembly of the machine.....	56
4.4 Machine testing.....	56
4.5 Efficiency of the machine.....	57
4.6 Capacity of the machine.....	57
4.7 The percentage loss.....	58
<b>CHAPTER FIVE: CONCLUSION, CHALLENGES AND RECOMDATION .....</b>	<b>61</b>
<b>CONCLUSION .....</b>	<b>61</b>
<b>CHALLENGES .....</b>	<b>61</b>
<b>RECOMMENDATION.....</b>	<b>62</b>
<b>APPENDIX ONE .....</b>	<b>65</b>
Tables with parameters used in the design of the machine components.....	65
<b>APPENDIX TWO .....</b>	<b>69</b>
Drawings of the parts of the machine .....	69
<b>APPENDIX THREE.....</b>	<b>73</b>
Pictures showing the fabricated machine and testing process .....	73

## LIST OF FIGURES

Figure 2.1 shows the structure of a maize cob .....	7
Figure 3.1: maize cob milling machine.....	18
Figure 3.2: Exploded view of the machine .....	19
Figure 3.8.1: shows the belt and pulley arrangement .....	28
Figure 3.8.2: shows the loadings on the shaft.....	30
Figure 3.8.4: Bending moment diagram .....	31
Figure 3.8.4: shear force diagram .....	32
Figure 3.5: show the hopper design .....	45
Figure 3.17: showing machine frame.....	51
Figure 3.17.2: showing the milling chamber housing.....	52
Figure 3.17.3 showing the milling chamber .....	53

## LIST OF TABLES

Table 2.1: shows nutrients and mineral contents found in a maize cob.....	12
Table 3.15: showing the dimensions and weight of the machine component parts.....	48
Table 3.16: shows the proposed materials to use in the fabrication and assembly.....	50
Table 4.2 showing the used materials in fabrication and assembling.....	56
Table 4.5: For calculating the efficiency of the machine.....	57
Table 4.6: for determining the capacity of the machine .....	58
Table 4.7: For calculating the losses during milling.....	59
Table 4.7 shows the project budget.....	60
Table A: shows motor pulley and belt selection parameters .....	65
Table B: shows the criterion for bearing selection .....	65
Table C: shows selection of service factors .....	65
Table D: shows the standard belt length.....	66
Table E: shows speed ratio factors.....	67
Table F: Arc of Contact Correction Factors .....	67
Table G: For selection of belt length correction factors .....	68

## CHAPTER I: INTRODUCTION

This chapter underscores the importance cereal to man and animals as a food source and as a raw material for processing industries. The problem to be addressed in this study as well as the purpose and rationale of the study are provided in this chapter; the objectives and scope of the study are also clearly outlined.

### 1.1 BACKGROUND OF THE STUDY

Maize (*Zea mays L.*) a source of maize cob was domesticated over 6000 years ago in what is now Mexico, from a wild grass called teosinte. Maize is a monoic annual plant which belongs to maideas tribe and the grass family of gramineae. it is originally a New World crop which was introduced in Uganda in 1861 and by 1900 was already an established crop. The World Bank estimates that there are about 1.3 million hectares of land suitable for maize production in Uganda, Main maize growing areas being the fertile soils around the northern periphery of Lake Victoria.

Maize was easily adopted because of its excellent storage properties if properly dried, it gives one of the highest yields per man-hour of labour spent on it, it provides nutrients in a compact form, it is easily transportable and the husks give protection against birds and rain, it is easy to harvest and hull, it does not break easily, it can be harvested over a long period, first as mature cobs, and can be left standing in the field for several weeks beyond physiological maturity. It can also be successfully inter-cropped with many other food crops and thus saves on land and cannot affect food security as it matures earlier than the other crops. (Djatkov, et al 2011)

Maize is used in homes, schools, institutions, hospitals and universities as a reliable source of food, it is also used in industries to manufacture oil. in addition, it's a major energy source in poultry and livestock feeds. This poses a challenge as the quantity of grains available for the expanding human population in addition to animals is limited. Other factors complicating this include poor storage facilities and environmental factors like flooding which reduces the end quantity of cereals available for use as food and feed, leading to competition between humans and animals for grains. The overall result is a continuous rise in the market price of grains. The high cost of feed is reported to be