



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

FACULTY OF ENGINEERING

**DEPARTMENT OF AGRICULTURAL MECHANIZATION
AND IRRIGATION ENGINEERING**

**DESIGN AND CONSTRUCTION OF A MEDIUM SCALE
SUGARCANE DE-TRASHING MACHINE**

BY

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ABSTRACT

Sugarcane (*Saccharum* spp.) is the world's largest crop by production quantity. In addition to it being used for sugar production as a primary use which is then used in producing a number of products such as cakes, soft drinks, alcohol and numerous other foods, it's also a source of income to the out growers. During harvesting operation, detrashing of cut sugarcane stalk is an important activity aimed at delivering cane stalks of good quality to the mill which is measured by sucrose and trash content.

However the existing sugarcane de-trashing machines are big, expensive and some are coupled with a strong walking tractor with a high power diesel engine which Ugandan out growers cannot afford thus have remained used in highly sugarcane producing countries. The aim of this study is to design a small portable diesel engine powered sugarcane de-trashing machine to help reduce on the much time taken in manual detrashing of cut sugarcanes, reduce on the number of cane cutters employed and increase the detrashing efficiency.

Designing and constructing of the various components of the sugarcane detrashing machine involved putting into consideration of the minimum force that can cause cracking of the top part of the cane in determining the appropriate diameter of the roller, determining the centrifugal force required to pull the cane through the detrashing unit, determining the appropriate size of the detrashing unit and analyzing the forces acting on the components to prevent failure of the machine during operation. Force analysis led to selection of proper materials to withstand the forces to avoid failure. Engineering drawings of the various components of the machine were designed before the machine was constructed and assembled. The performance of the sugarcane detrashing machine was construction and evaluated taking into consideration the feeding capacity, time taken and the efficiency of the machine. The obtained results reveal that it is recommended to operate the machine with a diesel engine of 2800rpm, rollers groove separation of 31mm (minimum cane diameter), and brush fiber separation of 36mm (maximum cane diameter). Therefore it is recommended that this sugarcane detrashing machine should be manufactured and put to test by the sugarcane out growers in Uganda and will help to eliminate sugarcane burning, minimize the costs in harvesting operation, speed up the sugarcane de-trashing process and hence increase on the production output.

DECLARATION

I *Saka Tom*, BU/UG/2014/8 declare to the best of my knowledge that the work presented in this final year report is my own and has never been presented to any university or higher institute of learning for any academic award.

Sign: *ST*

Date: *29/05/2018*




APPROVAL

This final year project report has been submitted to the Department of Agricultural Mechanization and Irrigation Engineering for examination with approval from the following supervisors:

Dr. MUSINGUZI WILSON BABU

Signature.....

Date.....

Mr. MUYINGO EMMANUEL

Signature.....

Date.....

DEDICATION

This report is dedicated to my beloved parents Mr. NSAMBA LOZIO, and Mrs. NANKULA JOYCE in appreciation for their selfless care and great support provided to me since childhood and for the spirit of hard work, courage and determination instilled into me which attributes I have cherished with firmness and which have made me what I am today. To my beloved brothers and sisters and all my course mates. I also dedicate it to my constituent member of parliament, Kamusiime Innocent Pentagon and all my friends for the guidance they have given me in all aspects of life, I pray that may the almighty God reward abundantly for such good work.

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ACRONYMS

MTTI	Ministry of tourism, trade and industry
FAO	Food and Agricultural Organization
MTIC	Ministry of trade, industry and cooperatives

CHAPTER ONE

1.0 INTRODUCTION

This chapter presents the general information about the research design giving its background, problem, significance, objectives, justification and scope of the study.

1.1 BACKGROUND

Sugarcane (*Saccharum* spp.) is a tall perennial tropical grass with a single un-branched stem of average height in the range of 3 to 4m and a stem diameter range of 3 to 5cm depending on the species (Bailey, 2004). It is the world's largest crop by production quantity with a worldwide harvest of 1.83×10^9 tones from more than 120 countries (FAO, 2012). It matures and ripens between 12 to 18 months (Anon, 2010). It originated from southern Asia (Chou, C.C., 1993) and favoured by altitude 36.7° N and 31.0° S, from sea level. It has been around in Uganda for over 100years and currently Kakira Sugar Company is the leading consumer of Uganda's sugarcane. The company has almost over 10000ha under cane cultivation and most of its cane consumption is supplied by surrounding out growers contributing about 65% and 35% is got from its plantations (Barbara Among The New Vision 9 December 2008). Generally according to MTIC (2010) 50% of total cane requirement of the major sugar factories in Uganda is supplied by the out growers.

Sugarcane is grown and harvested for sugar production as a primary use which is then used in producing an infinite number of products such as cakes, soft drinks, alcohol and numerous other foods. The pulp is recycled and used to make cardboard and other products. Sugarcanes are harvested either as green canes or burnt canes but green cane harvesting is recommended (Smith *et al.*, 1984). In Uganda, the cane harvesting operation is done entirely manually which makes it heavy and tedious work. Therefore it requires carefully cutting and handling procedures with skilled labour in order to deliver cane stalks of good quality to the mill which is measured by sucrose and trash content (Richard *et al.*, 1996).

During manual harvesting, the cutter holds the cane stalk at the middle in one hand and uses a curved blade knife held in the other hand to cut the stalk at the bottom close to the ground, de-tops the immature internodes, de-trashes the cane stalk and throws it behind where it is collected, tied in bundles and finally loaded onto the trailer to be transported to the factory.

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