



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

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

**DESIGN AND CONSTRUCTION OF CEREAL CROP RESIDUE
CRUSHER MACHINE**

BY

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ABSTRACT

Cereal crop residues are fibrous parts of crops that remain after those edible to human beings have been removed. Field cereal crop residues and industrial cereal crop residues. Field crop residues are those that remain in field after harvesting and industrial crop residues are those that remain after being processed. Farmers in Uganda use cereal crop residues mainly in different ways such as for fuel as firewood and minor constructions but the major use is for livestock.

The objectives of this work are to design a cereal crop residue crusher machine, to fabricate the components of cereal crop residue crusher machine based on the design specifications, to test the cereal crop residue crusher machine after fabrication and assembly of the components and carry out economic evaluation.

In designing material selection, ergonomics, the techno-economic status of medium scale farmers were considered for the intended users of the machine. The functional parts of the machine included hopper this is where cereal crop residues are stored first before in-feed, knives for chopping the cereal crop residues, rotating hammer blades this unit crush the crushed material to smaller size by impact, screen for segregating the output material according to their sizes and channel the outflow of the required particle size, pulley belts and pulleys for motion transmission components from power source to shafts, shafts for torque transmitting components.

In operation, the angle of repose on hopper makes cereal residues stalks flow easily towards the cutting unit where the rotating cutting blade and counter shear chops the material. The chopped material is transmitted towards the crushing unit consisting of swinging hammers responsible for crushing the chopped material to small particles. This process of crushing is successfully achieved with screen this screens segregates the size of crushed material required at the discharge outlet.

Powered by a 5hp motor/engine, the crusher has crushing efficiency of 82%, crushing capacity of 0.33kg/min. The cereal crop residue crusher machine can be used for small rural and urban communities.

DECLARATION

I Abal Sam solemnly affirm that this project report is the work of my hands and has never been submitted to any university, college or any other Institution for any academic award.

ABAL SAM

Date:.....  30th May 2016.....



APPROVAL

This project report was compiled and submitted to the department of Agricultural Mechanization and Irrigation Engineering under the supervision of;

- **Main Supervisor:**

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DEDICATION

I dedicate this work to my young sister and brothers Adero Mary, Ogwang Morris and Otwili James who committed their valuable time during times of hardship.

Special dedication goes to the family of Mr. Okello Richard and Mrs. Apio Grace for without you I wouldn't be where I am who committed their valuable time and finances to my studies.

May the Almighty God bless you abundantly.

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LIST OF ACRONYMS

LVZ- Lake Victoria agro-ecological Zones

GHG-Green House Gases

MICS-Morbark Integrated Control System

MEMD- Ministry of Energy and Mineral Development

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CHAPTER ONE

1.0 BACKGROUND

Cereal crop residues are fibrous parts of crops that remain after those edible to human beings have been removed. Field cereal crop residues and industrial cereal crop residues. Field crop residues are those that remain in field after harvesting and industrial crop residues are those that remain after being processed. Crop residue has become the used term in tropical research and development circles for describing the fibrous by-products of cereals, sugarcane, roots and tubers, pulses, oilseeds, oil plants, vegetable and fruits. With notable exemptions e.g. sugar beet pulp and citrus pulp, utilization of crop residues as feed has been the subject of intense research and development (Singh et al. 2011). The quest to increase the agricultural production, have intensified crop production by way of increasing cultivated areas thereby reducing the grazing areas. Livestock farmers especially in the sector of goats, sheep and cattle are constantly faced with problem of feed shortage during the dry season. The herd constantly relies on crop residue, but these are usually in short supply. Hence ruminants experience seasonal weight gain and loss during the wet and dry periods respectively during the year.

Cereal crop residues have been used as livestock feeds because they are readily available feed sources and are cheap. However, their nutritional value is poor hence supplementation is needed to improve their nutritive value. To address some of these feed challenges in the tropics, a lot of research efforts have been directed towards the use of low cost alternative feed resources (Katongole et al. 2012). In Uganda, different methods of cereal crop residues utilization are used such as chemical treatment using sodium chloride (salt), biological treatments sprayed crop residues with additives that included molasses, salt and physical processing means by chopping to smaller sizes using forage cutters. According to (Atuhaire et al. 2014) the survey carried out show that only 14% of farmers in were noted to process crop residues before feeding them to dairy animals. Of the farmers that process crop residues, 46.2% were noted to execute nutritional improvements technologies through highly fermentable energy sources such as adding molasses, the rest of the farmers (54%) practice physical processing technologies such as chopping and only one farmer reported the use of biological processing technologies and 15% of the farmers were noted to preserve crop residues. However, preservation was only practiced in the Lake Victoria agro-ecological Zones (LVZ) and with 94% out of those preserving residues simply drying them and only 6% preserved them in form of silage. These methods cannot be used

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