

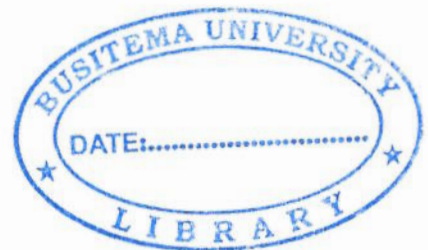


**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**FACULTY OF ENGINEERING**  
**chemical and processing Engineering**  
**Department**

**DESIGN AND CONSTRUCTION OF AN IMPROVED MANUALLY POWERED COFFEE  
PULPER**

**By**  
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**BU/UP/2014/199**

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*A report submitted in partial fulfilment of the requirement for the award of the Bachelor  
of Science in Agro Processing Engineering of Busitema University*

## ABSTRACT


Coffee is an important cash crop contributing 20% of Uganda's foreign exchange and about 500,000 households depend on coffee production as a major source of income and mainly is grown by smallholders with an estimated average coffee farm size of 0.58 hectares processing is done by dry and wet method. Wet processing has been found to enhance the taste of both Arabica and Robusta. It has the added advantage of producing coffees of superior quality which translate to better prices in the market. Predominant methods amongst the on farm based units are hand pulpers which are owned independently or co-owned and shared in rotation by groups of coffee farmers. However where farmers can neither access a hand pulper nor afford to pay for its services a lot of improvisation and traditional methods have been employed under wet processing to pulp coffee. This method is time wasting, energy sapping, deteriorates the quality and low output. To overcome this problem, this study chose as its main objective to design, construct and test pulping efficiency and output of pedal operated coffee pulping machine, the material of construction was selected based on strength, availability, durability and corrosiveness. The two units pulping and feeding roller units were incorporated in a single machine in order to prevent drudgery associated with the traditional method of pulping and separation of the pulp from the pulped coffee parchment. The first unit consists of a feeding roller; which evenly feeds the coffee cherries into the clearance. The second unit of the machine consists of the pulping drum. The performance of the machine was evaluated following optimum operating condition of the length of pulping shaft, speed of rotation of the pulping shaft and the feeding roller rotating shaft, and energy produced by the pedal. The machine was tested and the pulping rate was 31kg/hr, pulping efficiency of 76% were obtained. The results were relatively high as compared to the traditional methods and that designed by Muhire Nelson. The pulping efficiency is less than 100% because of the variation in coffee cherries and non-uniformity in the pulping drum since some could pass through the clearance between pulping drum and breastplate which affected the efficiency of the machine.

**Key words:** pulping, coffee cherries, pulping efficiency, pulping output.

**DECLARATION**

I, MUWONGE RONALD do hereby declare that this research project 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.

MUWONGE RONALD

Date. 23<sup>rd</sup> May-2018 



**APPROVAL**

This project report has been submitted for examination with approval from the following supervisors:

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Sign.....

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## DEDICATION

I dedicate this project report to my beloved father Mr. Sentongo Charles and the Mum Mrs. Naigaga Juliet for the selfless care and support provided to me ever since I started studying. I thank you for the spirit of hard work, courage, love, care and determination you have instilled in me throughout my school days till today, more so the advice, motivation given to me.

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## 1.0 CHAPTER ONE INTRODUCTION

This chapter includes the background of the study, the statement of the problem, the justification, the objectives and the limitations of the study.

### 1.1 Background

Coffee "*coffea*" is one of the most popular beverage crops grown in many parts of the world. Main coffee producing countries include: Mexico, Indonesia, Brazil, Colombia etc. World coffee production in 2006/07 was 123.6 million bags (60 kg bags), (USDA June 2006).

In Africa, coffee is grown in few areas which include; Ethiopia, Kenya, Rwanda, Tanzania, Zimbabwe and Uganda. Coffee is Uganda's biggest export commodity, produced mainly by an estimated one million smallholder farmers (<2.5 ha). Arabica (*Coffea arabica* L.) and Robusta (*Coffea canephora* Pierre ex Froehn.) are the two coffee species grown. Robusta is dominantly cultivated at lower elevations (<1400 m) such as in Central and Northern Uganda and Arabica is dominant at higher elevations (>1400 m) such as Eastern, Southwest, and Northwest Uganda.(Wang *et al.*, 2015)

There are two ways of coffee processing namely dry processing and wet processing

The two methods of processing coffee fruits (berries) are wet and dry, but the wet method has become more popular, produces quality green beans and fetches higher prices. The wet method preserves instinct qualities of coffee, such as aroma, and produces beans that maintain natural quality better, mostly preferred by consumers hence the farmers are to pulp coffee.(Coffee, 2017)

#### Dry processing

Dry process, also known as unwashed or natural coffee, is the oldest method of processing coffee. The entire cherry after harvest is first cleaned and then placed in the sun to dry on tables or in thin layers on patios, It may take up to 4 weeks before the cherries are dried to the optimum moisture content, depending on the weather conditions. The drying operation is the most important stage of the process, since it affects the final quality of the green coffee. A coffee that has been over dried will become brittle and produce too many broken beans during hulling (broken beans are considered defective beans). Coffee that has not been dried sufficiently will be too moist and prone to rapid deterioration caused by the attack of fungi and bacteria.(The Coffee Wiki, 2013)

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