



**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**FACULTY OF ENGINEERING**

**DEPARTMENT OF AGRICULTURAL MECHANIZATION AND  
IRRIGATION ENGINEERING**

**DESIGN AND FABRICATION OF A MOTORIZED COCOA POD SPLITTING  
AND SEPARATING MACHINE**

**BY**

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## ABSTRACT

Cocoa is an important cash crop that serves numerous food purposes. The principal use and economic importance of cocoa is found in the industries of cosmetics, pharmaceuticals, beverages, soft drinks, flavoring agents and confectioneries. Cocoa powder is essentially used as flavor in cakes manufacture, biscuits, ice cream, dairy drinks (beverage industry) and in of coatings for confectioners or frozen desserts. Husks are used as organic fertilizers and in liquid soap making.(Caleb and Akinnuli, 2019).

Splitting and removing the seed from the pods is key to its vast applications. In an attempt to ease the bottleneck in breaking the pods to release the seeds for utilization, a motorized cocoa pod splitting and separating machine is needed to efficiently split various sizes of cocoa. Fabrication was done using locally available materials to achieve reduction in production cost, stress and drudgery attributed to the manual methods of splitting. Different components of the machine were designed basing on the physical, mechanical and chemical properties of the cocoa pods. The essential components of the splitting and separating machine are the hopper, the splitting unit, the separating unit, the frame, the power unit, driving mechanism and analyzing forces acting on the components to prevent failure.

From the designs, splitting unit operates at a speed of 270rpm and the separating unit at a speed of 330rpm with a total maximum transmitted power requirement of 3hp. After fabrication, the performance and economic analysis of the machine were performed in terms of machine efficiency of 88.9%, percentage mass damage of 2.1%. Machine's total investment cost; Ugx. 831800, the net present value of 1,437,013.913 and profitability index of 1.73, and since NPV is greater than 0, the project is viable, owing to the performance and economic analysis of the machine, it achieves all its design purposes hence it is recommended for commercialization and adoption by the target groups.

**DECLARATION**

I MBUSA EDSON LUCUS declare that the work presented in this final project report is my own and has never been presented to any University or higher institute of learning for any academic award.

Signature.....

Date.....



**APPROVAL**

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

Supervisor:

Name: .....

Signature.....

Date.....

## DEDICATION

I dedicate this report to my family which has worked restlessly to push me to this academic height. Especially my beloved daddy MR. BASULENE ALOZIA, my beloved mummy MRS. NAUME BASULENE and all my brothers and sisters for their support towards my success. I also dedicate this report to the lord for the gift of life and also enabling me to study under his protection and care.

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**May the ALMIGHTY GOD Bless you abundantly**

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## **CHAPTER ONE: INTRODUCTION**

This chapter describes the classification, the origin, the dissemination and the progress of cocoa production ranging from the world view followed by regions and finally the country/area of where the research program is being carried out from.

### **1.1 Background**

Cocoa is one of the cash crops of great significance grown in the world. Cocoa is grown in Africa, Asia, Central and South America in countries that lie within 20° north and south of the Equator. Cocoa was cultivated by the Mayas over 1500 years ago. (Motamayor, Ortiz and Postgraduados, 2002) It is believed that cocoa was introduced in Africa as far back as 1822. Cocoa cultivation was introduced in Uganda nearly 100 years ago and the main cocoa growing areas in Uganda are Mukono, Jinja, Iganga, Kamuli, Bundibugyo, Hoima, Masindi, Kabale, Mpigi and Luwero growing the following Varieties of cocoa forastero, criollo and trinitario. The shape of the cocoa pod is ellipsoidal, hence the pod has major diameter, minor diameter and intermediate diameter with different thickness. The criollo pods have the largest diameter size of 190mm, Trinitario variety has 175mm and the forastero variety has 132.5 mm considering the average values of the diameters of these varieties.

The main season in Uganda for cocoa harvest is from September to late January and the minor season is from May to August.

In the year 2018/2019 the world cocoa production was 4,296 (in 1000 metric tons) and Africa accounts for 70% of this global cocoa production. Cocoa is primarily a smallholder farmer crop. Uganda's cocoa production increases yearly due to an increase in the number of farmers participating in the growing of the crop. Uganda exports about 26,000 tons of cocoa and more than 70% of it is produced by Bundibugyo. (Jerome , 2018)

The most useful part of the Cocoa plant is the cocoa beans. The principal use and economic importance of cocoa is found in the industries of cosmetics, pharmaceuticals, beverages, soft drinks, flavoring agents and confectioneries. Cocoa powder is essentially used as flavor in cakes manufacture, biscuits, ice cream, dairy drinks (beverage industry) and in of coatings for confectioners or frozen desserts. Husks are used as organic fertilizers and in liquid soap making. They are burnt to ash, dissolved in water and boiled, then filtered to get liquid soap. (Caleb and Akinnuli, 2019).

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