BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF AGROPROCESSING ENGINEERING

DESIGN AND CONSTRUCTION OF A MANUALLY OPERATED TOMATO SORTING MACHINE

BY

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ABSTRACT

Tomato is a major crop of world commerce and supplies the essential nutrients in human diets. Tomatoes are widely grown and used by very many people in Uganda and other Nations. The increasing consumer population has created market for both raw tomatoes and their products, thus encouraging higher production and mechanization.

One of the challenges faced by the tomato growing farmers and processers is sorting of tomatoes. Most of them employ human labour to do the work; this becomes expensive by consuming a lot of money that would be part of their profits besides the inaccuracy of the method. Others who attempt to purchase existing tomato sorters find them expensive and not compatible to their scale of production.

As a result this has caused a need for the design and construction of a simple tomato grader which will be easy to operate, cost friendly to both medium and large scale tomato farmers and producers, does not require electric power and has high accuracy. The designed machine will solve the problems of inaccuracy and high costs of human beings in doing the work. It is easy to operate by all users, easy to maintain and repair, not gender sensitive and operates at the lowest costs possible. It has been made of different component parts such as the power unit, the sorting unit, the frame and feed unit.

The machine has been constructed from simple materials possible and available. It helps in the sorting of tomatoes according to their sizes of large, medium and small.

To achieve the required design, forces acting on the different machine component parts were analysed using the appropriate formulae for both load and no load conditions, material properties were considered, a favorable design made and proper materials selected for construction. The dimensions of the parts were also determined basing on the size and capacity of the machine required besides standard principles. After all the processes to design, the machine components were constructed from selected materials, assembled and tested for performance.

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DEDICATION

I dedicate this project to my beloved parents Mr. Mbarebaki Nathan and Mrs. Tumuhairwe Tophas for their endeavor to support me during my entire academic life.

APPROVAL

This project report has been submitted to the Department of Agro Processing Engineering for examination with approval from the following supervisors:

Ms. KABASA MARY SALLY

Signature……..

Date……..

Mr. ANDAMA OTUBO JUDE

Signature……..

Date……..

DECLARATION

I TWINAMATSIKO KENETH declare that the work presented in this project is my own and has never been presented to any University or high institution of learning for any academic award.

Signature.....

Date.....30/06/2014.....

LIST OF ACRONYMS

GDP.....Gross Domestic Product

MAAIF.....Ministry of agriculture Animal Industries and Fisheries

NARO .....National Agriculture Research Organization

CMA.....Centre of Management in Agriculture

NAADS.....National Agricultural Advisory Services

CAD.....Computer Aided Design

FAO.....Food and Agricultural Organization

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Uganda is an agrarian nation with more than 80 percent of its population engaged in small-farm agriculture as source of income. Agriculture is the most important economic activity accounting for 43% of the Gross Domestic Product (GDP) (MAAIF&MFPED, UNDP, 2007).

Tomato *(Solanum lycopersicum)* is a major crop of world commerce and supplies the essential nutrients in human diets. According to research conducted by Ohio State University (1999), tomato production is an important part of Uganda's economy, as well as a food source for its people. However, Uganda's rainy season makes tomato plants very susceptible to diseases and pests. For the home gardener in Uganda, growing tomatoes is a challenge best met with planning and careful maintenance.

Tomatoes originated from the Andes, in what is now called Peru, Bolivia, Chile and Ecuador - where they grew wild. They were first cultivated by the Aztecs and Incas as early as 700 *AD* (Flavourfresh ltd, 2005). However there are two competing hypotheses of the origin of domestication of tomato, one supporting a Peruvian origin, another Mexican origin (Peralta, *et al,*. 2007). The wild tomato species are native to western South America from Ecuador south to northern Chile and the Galapagos Islands. The progenitor of the cultivated species (*Solanum lycopersicum* and *Lycopersicon esculentum*) currently is widespread throughout warm regions of the world. Tomatoes spread throughout the world following the Spanish colonization of the Americas. It arrived in Europe in 1523 and later spread by Europeans to other continents (George, *et al,* 2013)

In Uganda, tomatoes are mainly grown and brought from the lake basin, Kabale, Kasese, Mbale, Kapchorwa, Mubende, Masaka and Wakiso districts (Faustin, 2008). The common varieties in Uganda include; Money maker, Margrobe, Bonny Best, san-marzano, Heinz, MT55, MT56 and Amateur (Faustin, 2008). Tomatoes are marketed mainly in Kampala markets (Nakasero, Owino,

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