

# **FACULTY OF ENGINEERING**

## **DEPARTMENT OF AGRO - PROCESSING ENGINEERING**

# DESIGN AND CONSTRUCTION OF AN EVAPORATIVE CHARCOAL COOLER FOR FRESH TOMATOES

BY

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#### ABSTRACT

Food supply can be induced either by increase in production or reduction in loss. Many post harvest losses are direct result of factors such as high field temperatures on tomatoes before and after harvesting, poor storage, pests and diseases attack and many others hence increase in the losses after harvest.

The purpose of the study was to help in enhancing the quality and prolong the shelf life of fresh tomatoes through the knowledge of constructing an evaporative charcoal cooler that is economical, easily operated and socially friendly in terms of operation.

The study objectives were to design, construct and assemble the different components of an evaporative charcoal cooler. These were done and achieved by using the knowledge engineering drawing, different soft wares such as AutoCAD, Solid edge to come up with the sketches of the drawings for the designs. Measurements were done using tape measures, and others so as to come up with the required material sizes and dimensions from which assembling activities were done and they included joining through hammering, gluing, tightening by binding wires and others.

However the study was limited to designing, constructing and testing of an evaporative charcoal cooler. These tests included temperature tests, relative humidity tests for the ambient and the cooler and physical tests on tomatoes. Here different tables were used in data recording at different and specific intervals so as to evaluate the performance of the cooler and come up realistic deductions and recommendations in relation to the study. In addition an economic analysis of the cooler was also performed through which a payback period was used an economic evaluation method after having cost benefit analysis the cooler.

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## DECLARATION

I	akumbi	Fred	declare	that the	contents	of this	study	report	are	my
original v	work and it has	s never been sub	mitted to	any instit	tution of l	earning	for any	award		
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## APPROVAL

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

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### DEDICATION

I dedicate this report to my beloved parents Eng. Stephen Nyanzi and Mrs. Noelina Nyanzi and the entire family who have been very supportive to me throughout the entire process of my academics. And also to my dear fiancée Proscovia-k for the encouragement and pressure she was giving me during the entire process of project development.

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# LIST OF ACRONYMS

NARÖ	-	National Agricultural Research Organization
KARI	-	Kawanda Agricultural Research Institute
РНР	-	Post Harvest Program
FAO	_	Food and Agriculture Organization
Eng	-	Engineer
kg	-	Kilogram
ha		Hectare
Dr.	-	Doctor
APE	_	Agro- Processing Engineering

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#### CHAPTER ONE

#### **1. INTRODUCTION**

#### 1.1 Back ground

Tomato is indigenous to the Peru and Equador region in South America and it probably evolved from Lycopersiconesculentum Mill (scientific name), and belongs to the family Solanaceae. However, it was domesticated and first cultivated in Central America by early Indian civilizations of Mexico. The Spanish explorers introduced tomato into Spain and it was later taken to Morocco, Turkey and Italy. In Italy and France, it was termed "love apple". It was widely believed that the tomato was poisonous and its use as a food crop was only accepted in the 18th century. Tomato is now one of the most popular and widely grown vegetables around the world (Naika *et al*, 2005).

The tomato plant is very versatile and the crop can be divided into two categories; fresh market tomatoes, and processing tomatoes, which are grown only outdoors for the canning industry and mechanically harvested. World production and consumption have grown quite rapidly over the past 25 year and the world tomato production in 2001 was about 105 million tons of fresh tomatoes from an estimated 3.9 million hectare (Naika *et al*, 2005).

Fresh tomatoes are very important sources of vitamins, minerals, essential amino acids, sugars, and dietary fibres that are essential for healthy human diet. In addition tomato has become an important cash and industrial crop in various parts of the world. One of the reasons for this increase is that tomato cultivation is now being moved to places and seasons that are originally unsuitable for its productivity thereby resulting in an increase in the economic importance of the crop (Bodunde *et al*, 1993). However, the quality and nutritional value of fresh tomato produce is affected by post harvest handling and storage condition in the tropics. (Sablani *et al*, 2006).

In Uganda today, tomatoes are mainly grown in the lake basin areas of Kabale, Kasese, Mbale, Kapchorwa, Mityana, Mubende, Masaka, and Wakiso. Tomatoes are cultivated through out the year and are usually harvested when they are fresh and high in moisture content and are thus distinguished from field crops, which are harvested at the mature stage for grains, pulses, oil seeds or fibre. This high moisture content of tomatoes makes their handling and storage,

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