FACULTY OF ENGINEERING

DEPARTMENT OF AGROPROCESSING ENGINEERING

DESIGN AND CONSTRUCTION OF A MANUALLY OPERATED JACK FRUIT PULPING MACHINE FOR SMALL SCALE PROCESSORS

BY

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DECLARATION

I ARINDA GANAFA declare to the best of my knowledge that the work presented in this project report is as a result of my own research and effort and has never been presented or submitted to any institution or university for any academic award.

SIGNATURE .....

DATE 20.06.2014.....

APPROVAL

This project report has been submitted to the department of Agro processing engineering for examination with approval from the following supervisors:

1st supervisor

Ms. KABASA SALLY

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ACKNOWLEDGEMENT

I am so grateful to the Almighty God who has seen me through the years and who by His grace I have kept shining.

I extend my gratitude to all my Lecturers at the Faculty of Engineering, Department of Agroprocessing Engineering, who have equipped me with academic knowledge that has guided me in a bid to come up with this report. Special thanks go to Ms. Kabasa Mary Sally and Mr. Okirya Martin whose directions and guidance have enabled me to successfully compile the material herein.

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DEDICATION

I dedicate this report to my dear parents Mr. and Mrs. Ganafa William, for the love, care, support, encouragement, and belief in me that has got me this far.

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ABSTRACT

Today's consumers with busy lifestyles need development of value added products owing to the fruit's sticky sap exuded from the rinds, voluminous size, strong aroma and laborious preparation operations.

Marketing and consumption of jackfruit is done locally as whole-fruit on a large scale or minimally processed products whereby the fruit bulbs are separated from the whole-fruit and consumed fresh. Jack fruit processes include; slicing, pulping, drying and canning to help prolong their shelf life for preparation of value added products (Chowdhury *et al.*).

A manual pulping machine is thus required so as to extract pulp which is used in the making of jam; juice which is consumed is utilized as a soft drink (cocktail) when mixed with other fruit juices. In a day a minimum number of 10 jackfruits having a capacity of 20kg/hr can be worked on to produce a pulp efficiency of 65%.

The pulping machine can be used by all groups of people thus isn't gender sensitive and can be affordable to small scale processors.

This report contains chapter one which brings out the background on jackfruits, objectives of the study, the problem statement as well as its justification. Chapter two highlights the existing technologies available for pulping jackfruits and explains why the theories exist and their related constraints.

Chapter three explains the steps that enabled me achieve the objectives of the project and how they were evaluated. While chapter four entails the results obtained well discussed and chapter five contains conclusions and recommendations.

The scope of the project involved pulping jackfruit bulbs to extract both juice and pulp to be used in the production of value added products

The objective of the study was thus to design, construct, test and asses the economic evaluation of a manual jackfruit pulping machine.

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CHAPTER ONE
INTRODUCTION

1. Introduction

This chapter gives the general information relevant to the research topic whilst clearly showing the problem of interest for the intended research. It also shows how the significance of the study is relevant to Agroprocessing engineering in Uganda. The study will help reduce the challenges encountered Jackfruit processing through the fulfilment of objectives and activities listed there in.

1.1 Background of the study

Jackfruit (*Artocarpus heterophyllus* L.) is a species of tree in the *Artocarpus* genus of the mulberry family (*Moraceae*). The tree is native to parts of South and Southeast Asia, and is believed to have originated in the southwestern rain forests of India,

The fruit is mainly categorized in two types that is; *Khuja* (green, pale green rinds, hard and smooth, with juicy pulp and small seeds) and the *Ghila* (rough, soft, with thin pulp, and large seeds). The Khuja type is considered for the production of juice and pulp because of its properties.

Production statistics of jackfruit in Uganda according to FIT (2007) reported fruit production in Uganda as often geared towards the domestic market and estimated per-capita/day consumption of fruits in Uganda was estimated at 29.4g.

In Uganda, jackfruit is a very common fruit in Eastern Uganda (within Busoga and the neighbouring regions) and in Central Uganda, particularly Mpigi (within Buganda and the surrounding areas). Marketing is usually done locally as whole-fruit on a large scale or minimally processed products whereby the fruit bulbs are separated from the whole-fruit and sold fresh as such.

The jackfruit consists of a combination of many volatile compounds that is; the esters and alcohols which contribute to its sweet and fruity aroma. However its strong aroma stands a challenge to many consumers.

The edible fruit bulbs of jackfruit are usually consumed raw or canned and no processing is done to preserve them so as to improve their shelf life. The pulping process helps extract juice (for cases where very ripe jackfruit is used) that can be prepared for cocktails and the

According to the economic evaluation, the machine was found to be affordable to the small scale processors.

REFERENCES

MORTON (1987).Fruits of warm climates (Ed: J.F. Morton). US. pp 58-64.

FIT Uganda LTD, 2007. Final Report: Study for Fruits Sub Sector, January 2007.

Design of Machine Elements, Second Edition, ISBN 0-07-061141-6,978-0-07-061141 Bhandari, (2007)

Shigley's Mechanical Engineering Design, Eighth Edition, ISBN: 0–390–76487–6, Budynas, Nisbett. (2006).

HORNBERGER et al. (2004). Design of Machine Elements, Eighth Edition, ISBN: 0-13-048989-1.

Aiyelagbe et al. (1991)Training Manual Series No 7 on Fruit Juice Processing,

F.A.O: Agric Science Bullet 13 Fruit Juice Processing, food and Agricultural Science Industries Services

Ozemoyah (1991). Design, Construction and Testing Performance of A Manually Operated Cage Press Nase/91/Pas/01.

Chemical composition of jackfruit (Artocarpus heterophyllus Lam) Food Chemistry 102:361–365