BUSITEMA UNIVERSITY
Pursuing Excellence

P.O. Box 236, Tororo, Uganda
Gen: +256 - 45 444 8838
Fax: +256 - 45 4436517
Email: info@adm.busitema.ac.ug

www.busitema.ac.ug

BUSITEMA UNIVERSITY

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

DESIGN AND CONSTRUCTION OF A SMART TEALEAF PLUCKER

BY

MWESIGWA WILBERFORCE

BU/UP/2014/201

Email: wilberforcemwesigwa201@gmail.com

Contacts: 0751414649/ 0781273133

SUPERVISORS: MR: MAKUMBI THOMAS

MR: KILAMA GEORGE

A final year report submitted to the Faculty of Engineering, Department of Chemical and Process Engineering in partial fulfillment of the requirement for the award of Bachelor's degree in Agro processing Engineering of Busitema University

ABSTRACT

In Uganda, tea plucking is done manually. This plucking activity creates damages on plucked tea shoots and excessive increase in diseases which in return affects the health of the people and deterioration tea quality and prices on international market. To overcome these problems, it is proposed to design and construct a smart tea leaf plucker is capable of plucking the standard tea shoots which are the two leaves and a bud from the tea bushes in Ugandan tea estates. The significance or contribution of the machine is that it enhances the quality tea leaf plucking with in the country and the neighboring countries.

DECLARATION

I Mwesigwa Wilberforce hereby declare to the best of my knowledge that this project report l is an outcome of my own work and has not been presented for any award in any university, college or institution of learning.

Signature.....

Date ....23/05/2018.....

APPROVAL

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

MR. MAKUMBI

Signature.....

Date: .....

MR. KILAMA GEORGE

Signature.....

Date.....

DEDICATION

This project report is dedicated to my parents Mr. Katsigaire Abel and Mrs. Kwatirabo Molly Abel from Kyazanga Lwengo district for the endless struggle in my upbringing up to this step. My friends and all the family members for their continual support, provision, encouragement.

ACKNOWLEDGEMENT

I am indebted to my dear brothers, sisters, relatives, classmates and friends to whom I extend my sincere appreciation for their guidance and support and the government of the republic of Uganda for the education that am receiving. I extend my sincere gratitude to all my Lecturers at the Faculty of Engineering, Department of Agro Processing Engineering who have equipped me with academic knowledge that has guided me to succeed in my studies for the four academic years. My thanks go to my supervisors Mr. Makumbi Thomas and Mr Kilama George whose directions and guidance enabled me to successfully complete my final year project. I thank the Almighty God for his grace, mercy, wisdom and protection

CONTENTS

Contents

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

The tea beverage is derived from young shoots harvested frequently during the growing season from tea (Camellia sinensis) bushes. (Han *et al.*, 2014) Presently, the favorable areas for tea growing require temperatures between 20^0C- 25^0C, annual average rainfall of between 1000mm and 1500mm for at least 150 days a year and altitude of over 1500m above the sea (Kawooya et Sal., 2015). Tea is largely grown along the Lake Victoria shores and lower slopes of the Rwenzori Mountains as well and above the Western Rift Valley. The two main ways to pick tea are manual plucking and mechanical harvesting. The manual picking is labor intensive and highly cost, and the mechanical picking uses the method of cutting, so it has a high breakage rate of tea leaves and harm to the tea trees (Wijeratne, 2009). Also it makes the subsequent sorting more difficult and it is not suitable for picking famous tea. The use of these machines make it difficult to maintain the required standard of the tea harvesting which should be two leaves and a bud all over the tea estate. ('Black Tea Processing Steps Green Tea Processing Steps White Tea Processing Steps', 2012)(Bengal et al., 2016) The selective tea plucking application in this field in Uganda is still in blank which has enhanced the poor quality tea plucking. The smart tea leaf plucker was to pick various kinds of tea piece by piece with a high performance microprocessor in digital signal processing and controlling. It has the special function of detecting the selective type of leaf used for the manufacturing of the first class tea. This machine's intelligence system is high when compared with others and it will work using a rechargeable battery (Sureshkumar and Muruganand, 2014).When all the conditions of the sensor are accepted then the machine starts to pluck the leaves and collects the selective type of leaves in the tray and it will not cause any damages to the plants

Maintenance of plucking table

The plucking table that consists of mother leaves and shoots indicates the level of estate management and its productivity. It also gives a good appearance to the estate. The shape of the plucking table varies from flat to dome in shape, depending on the method of plucking adopted. Usually, bushes that are manually harvested have a flat surface of plucking in parallel with the

References

1. Atmel, T. *et al.* (2016) 'ATmega328 / P'.
2. Cabrera, C., Artacho, R. and Gime, R. (2006) 'Beneficial Effects of Green Tea — A Review', 25(2), pp. 79–99.
3. Faculty, P. (no date) 'Sensors for Robots'.
4. Fay, B. D. (1950) '* THE MECHANICAL PLUCKING OF TEA (Dickwella Estate , Haliela) (Received l : th May , 1950).'
5. Food, M. A., Policies, A. and Fao, M. (2012) 'ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR TEA IN UGANDA DECEMBER 2012', (December).
6. Good, M. and Sweet, L. (1985) 'Dynamic Models for Control System Design of Integrated Robot and Drive Systems Dynamic Models for Control System Design of Integrated Robot and Drive Systems', (April 2016). doi: 10.1115/1.3140707.
7. Lin, C. Y. (no date) 'A Servo-Control-Gripper Design'.
8. Satheshkumar, A., Kirubakaran, D. and Muraleedharan, N. (2011) 'Impact of shear harvesting on the residues of hexaconazole and copper in black tea', 39(3), pp. 388–389.
9. Saxena, A. *et al.* (no date) 'Robotic Grasping of Novel Objects'.
10. Singh, P., Kumar, A. and Vashisth, M. (2013) 'Design of a Robotic Arm with Gripper & End Effector for Spot Welding', 1(3), pp. 92–97. doi: 10.13189/ujme.2013.010303.
11. 'Stepper Motor Theory of Operation' (no date).
12. Sureshkumar, A. *et al.* (2016) 'Design and Development of Selective Tea Leaf Plucking Robot Design and Development of Selective Tea Leaf Plucking Robot', (September 2013).
13. Sureshkumar, A. A. and Muruganand, S. (2014) 'Design and Development of Selective Tea Leaf Plucking Robot', 2(2), pp. 45–48. doi: 10.12691/acis-2-2-2.
14. Watson, M., Bandaranayake, J. I. H. and Wettasinghe, D. T. (1982) 'THE USE OF PLUCKING MACHINES FOR', 51(2), pp. 58–66.
15. Wijeratne, M. A. (2014) *SHOOT GROWTH AND.*