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**FACULTY OF ENGINEERING**

**DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION**

**ENGINEERING**

**FINAL YEAR PROJECT REPORT**

**DESIGN AND CONSTRUCTION OF A MANUAL ONION TRANSPLANTER**

**BY**

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## **ABSTRACT**

The horticultural industry more than ever before, provides one of the most promising areas for increasing incomes in the rural areas, improving nutrition of the people, diversification of exports, provision of raw materials for agro-based industries and creation of employment especially for the youth. The export of horticultural products is currently one of the fastest growing export sub-sectors in the country, estimated at 20%. This implies an increase in production of various horticultural produce. In Uganda, onions are mainly grown in the Eastern and Western regions. The common onion planting methods include; sowing seed directly in the field where the crop is grown, sowing seed in a seedbed from which the plants will be transplanted later to the growing field, sowing seed in a seedbed from which sets are planted later into the growing field.

The main objective of this project was to design and construct a manual onion seedlings transplanter that can be used to transplant the seedlings with minimal labour and product damage. The importance of mechanically planting seedlings is due mainly to the fact that this is one of the surest and easiest methods of producing green onions or large bulbs at a minimum planting cost.

The performance of the prototype was determined by the number of seedlings transplanted per minute, and the labour requirement. From the tests performed, it was established that only one person is required to transplant 132 seedlings per minute. The operator also maintains a good working posture whilst operating the transplanter.

**DECLARATION**

I NASSOZI SHAMILAH hereby declare that this project report is my original work except where explicit citation has been made. It also has not been presented to any institution of higher learning for any academic award.

Signature: .....

Date: .....

## APPROVAL

This is to certify that the project report under the title “**Design and Construction of a Manual Onion Transplanter**” has been done under my supervision and is now ready for examination.

Mr. Kavuma Chris

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Sign: .....

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## **DEDICATION**

This report is dedicated to my beloved mother Ms. Zainah Nakyazze for being my solid rock throughout my life. May Allah reward her abundantly.

## **ACKNOWLEDGEMENT**

First and foremost, I would like to thank Allah for enabling me reach this academic level, for his mercy and grace and never ending blessings.

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I also extend my sincere gratitude to Mr John Hendrickson who donated the paperpots that were used in the study.

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## CHAPTER ONE: INTRODUCTION

### 1.1 Background

Onion (*Allium cepa*) is a cool-season biennial crop typically grown as annual. Onions are one of the oldest cultivated vegetables in history, originating from central Asia from where they spread across the entire world. As an item of world trade, 60 million tons of dry onions are produced annually, with the crop being grown across 7.4 million acres in over 134 different countries. The current average world yield stands at 7.6 t/ac, but highest average yields of 17 - 26 t/ac. The average annual onion consumption is over 13 lb. of onions per person across the world. Between 15-18% of onions are processed for use in food items such as soups, relishes and sauces (YARA)

Uganda is basically an Agricultural country with about 90% of the population deriving their livelihood from farming. Over 50% of the Gross Domestic Product (GDP), 60% of the total government revenue and about 85-90% of the foreign exchange earnings all originate from this sector. (Ambrose and Muyinza). According to (Ambrose and Muyinza), the export of horticultural products is currently one of the fastest growing export sub-sectors in the country, estimated at 20%. This implies an increase in production of various horticultural produce such as onions, tomatoes, vegetables, flowers to mention but a few. The horticultural industry more than ever before, provides one of the most promising areas for increasing incomes in the rural areas, improving nutrition of the people, diversification of exports, provision of raw materials for agro-based industries and creation of employment especially for the youth (Lenny).

In Uganda, onions are mainly grown in the Eastern and Western regions. In Kabos, Serere District, onion growing is predominantly done on a relatively small scale (less than 5 ha). The onions are grown from seedlings as compared to the common methods of direct seeds or bulbs. Seeds are first sowed in a nursery bed and later transplanted to the seed bed. Before uprooting the seedlings, the nursery bed is wetted to soften the soil to reduce mechanical damage of the seedlings' roots as they are uprooted. The seedlings are then collected on a tray and transported to the already prepared seed bed. Furrow lines where the seedlings are to be transplanted are dug spaced at 30cm. Pegs and strings are used to ensure that straight parallel lines are made. Individual seedlings are gently held between two fingers and placed about 6cm into the ground and covered. Onion seedlings are naturally delicate and can be easily damaged when mishandled. During transplanting, great care is needed so as not to squeeze the tiny bulbs, and

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