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UNIVERSITY**  
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IRRIGATION ENGINEERING**

**DESIGN AND FABRICATION OF AN ANIMAL DRAWN UPLAND RICE  
PLANTER**

By

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## ABSTRACT

Upland rice is rice grown on dry land. NERICA varieties, particularly NERICA 4, have been well adopted, grown continually in wide agro-ecological conditions in mid-altitude ecology (mainly between 800-1400 meters above sea level). Rice acreage increased in Uganda from 1500ha to 50000ha by 2009 after NERICA introduction in 2002 and production level increased from 123000 metric tons to 180000 metric tons.

The literature of the existing upland rice planters (hand pulled and two-row animal drawn) is; the hand pulled rice planter causes back pain and hand muscle pain though it reduces on labor costs. The two-row animal drawn planter under-utilizes animal power. This calls for need of a four-row animal drawn upland rice planter.

Using basic engineering principles and some physical properties of rice such as, size, density and weight of the grain, the various components of the upland rice planter were designed and sized that is; the seed hopper, drive wheel, main frame, furrow opener, seed metering unit and delivery tubes. The drive is from drive wheels to drive the roller shaft where seed plates are rigidly attached. The prototype of an upland rice planter was subjected to station field testing using oxen and NERICA 4 seeds where 3 replications were performed to evaluate efficiency. The amount of seeds delivered through delivery tubes was determined from which economic evaluation in the long run was done.

Back pain and hand muscle pain while pulling the planter was reduced, draft power was utilized, and the number of hectares planted per day is expected to increase through designing an animal-drawn upland rice planter. The machine developed will improve crop and labor productivity and boost farmers' income while releasing valuable time for other activities. The proto-type should be adapted for use in Ugandan soil conditions. The technology should be utilized by a group of small scale farmers to boost upland rice production and rural development.

The project embraces the budget for the design, fabrication, testing and economic evaluation for the machine. The project costed 624,000 Uganda shillings.

## DECLARATION

I, **ATULINDA CHOLET NYANGOMA** sincerely declare that all the written material contained in this report is an account of my own efforts unless where cited and has never been submitted to any university or institution for an academic award.

Signature..........

Date.....2<sup>nd</sup> June 2018.....



**APPROVAL**

This project report has been submitted with the approval of the following supervisors.

MR. KIMERA DAVID

Signature



Date: 2<sup>nd</sup> June 2018

MR. ODONG SAMUEL ATOCHON

Signature.....

Date.....

## **DEDICATION**

I dedicate this final report to my beloved parents Mr. Beebwa Stuart Kajura Adyeeri and Mrs. Kajura Everce Ateenyi of Kyabigambire, Hoima who supported me both morally and financially through my struggle since my childhood, my Aunt Rose Kabaruli Akiiki, my brother Musinguzi Henry, my sisters and brothers not forgetting my aunties whose love, care, support, encouragement, patience and belief in me got me this far. The almighty God reward you abundantly.

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## ACRONYMS

|        |   |
|--------|---|
| NARO   | National Agricultural Research Organization |
| NERICA | New Rice of Africa                          |
| FAO    | Food and Agriculture Organization           |
| D A P  | Draft Animal Power                          |
| URA    | Uganda Revenue Authority                    |
| NACCRI | National Crops Resources Research Institute |
| IRRI   | International Rice Research Institute       |
| NPV    | Net Present Value                           |
| Rep    | Replication                                 |

## CHAPTER ONE:

### 1 INTRODUCTION

This chapter briefly analyzes the general information about the research design giving its background, problem statement, objectives, study scope and its justification and why it should be designed.

#### 1.1 BACK GROUND

Rice is a cereal crop that is rich in nutrients and complex carbohydrates plus vitamins like thiamine, which are very necessary to the human diet (Rice-wikipedia). Upland rice is rice grown on dry land. Rice (*Oryza sativa* L.) is a member of the Poaceae family, as are barley (*Hordeum vulgare* L.), wheat (*Triticum aestivum* L.), and corn (*Zea mays* L.). There are two species of cultivated rice. *Oryza glaberrima* originates from West Africa and is presently only grown near its center of origin, while *O. sativa*, which is originally from Asia, is grown on all continents in present-day.

Africa, *O. glaberrima* has been almost completely replaced by *O. sativa*. Rice, particularly upland rice, has become an increasingly important crop in Uganda since 2000 when NERICA( New Rice of Africa), a series of rice cultivars developed in the African rice center ( then WARDA ) by crossing *O. glaberrima* and *O. sativa*, was introduced to the region (WARDA, 2001). With its nature of no sterility and high yields, NERICA varieties, particularly NERICA 4, have been well adopted by farmers, diffused rapidly and grown continually in wide agro-ecological conditions in mid-altitude ecology (mainly between 800-1400 meters above sea level) (Haneishi, 2012).

The major challenge for upland rice production in Uganda is; farmers lack an implement that saves time and reduces drudgery in planting. The planting of upland rice is labour intensive and time consuming operation; farmers have very positively responded to planting upland rice in rows from traditional methods, such as broadcasting, dibbling, hand hoeing throughout the country but they are lacking an appropriate planting implement.

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