

FINAL YEAR PROJECT

**A NOVEL SOLAR POWERED FOUR CHAMBERED GRAIN STORAGE SILO FOR
SMALLHOLDER FARMERS.**

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*A final year project proposal submitted to the Department of chemical and Processing
Engineering in partial fulfillment of requirements for the award of **Bachelor** of Science in Agro-
Processing Engineering.*

3rd/01/2023

Declaration

We Mukama Musa, Mugalya Brian, Niwahereza Ishameil, Wanyama Paul and Mwanyi Ian, declare that this project work is our original effort and has never been produced in part or whole for any academic award in any university, college or institution of learning.

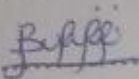
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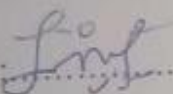
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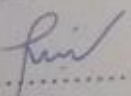
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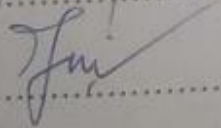
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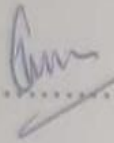
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Approval

This final report has been submitted to the Department of Agro-Processing Engineering for examination with approval from the following supervisors

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Dedication

We dedicate this report to our dear Parents for their support towards our academic advancement.

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Authors Contributions: All authors equally contributed towards the construction of the different parts of the project and assembling of these parts to come up with a single standing project. However, the work was divided among authors in the following ways.

Name	Activities
MUKAMA MUSA	Design of silo, its chambers and other components
MUGALYA BRIAN	Ergonomics and aesthetics and ladder design
WANYAMA PAUL	Silo monitoring system design
NIWAHEREZA ISHAMEIL	Sizing of the PV system
MWANYI IAN	Manufacturing processing, tools and equipment

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List of acronyms

1. SMS – silo monitoring system
2. ERF- ergonomics risk factors
3. LED- light emitting diode
4. LCD- liquid crystal display
5. IEA- international ergonomics association
6. PV – Photovoltaic

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1.0 CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

The production of diverse sorts of grains has improved progressively due to employment of advance production practices however, because of inappropriate storage facilities massive volumes of grains have been spoiled (Singh et al., 2018). Grain losses owing to poor storage practices in maize for example can reach 20-30 % under reasonable conditions.(Olorunfemi & Kayode, 2021). These storage losses are mainly due to the smallholder farmers with poor storage practices. Despite the fact that these smallholder farmers use poor storage technology which lead to sufficient grain losses, there is a need to store these grains in that storage of food after harvest is very important for smallholder farmers as it mutually guarantees them with food security and also protects them from exploiting food-merchants who want to buy the food cheaply at the time of harvest(Zachary et al., 2015). Smallholder farmers carry out inter-cropping (where they can grow more than one kind of crop on the same piece of land) on pieces of land less than 2 hectares where they are able to harvest to about 1.5 tons (of maize) per hectare and they contribute to one-third of the worlds' food(Omotilewa et al., 2018). These farmers mainly grow food for home consumption then the surplus can be sold off if the prices are favorable. The main reason therefore for food storage at smallholder farmer level is to keep food up to when the subsequent harvest starts for instance in some cases, maize is stored for nearly seven months till the next harvest jerks(Manandhar et al., 2018). Despite that fact that these smallholder farmers need to store food for about 7 months or more up to the next harvest, they still use traditional storage practices such as traditional granaries, hips in residence houses, woven polypropylene bags among others. However, traditional storage facilities such as granaries, cribs and woven polypropylene bags may prompt the grain to different deterioration agents and cannot guarantee the protection of stored grains for longer periods; thus, such grain losses are considered as one main cause of food insecurity for smallholder farmers in developing countries.(Costa, 2015; Duguma, 2020). Grain storage loss is a major contributor to post-harvest losses and is one of the main causes of food insecurity for smallholder farmers in developing countries.(Manandhar et al., 2018).

A study by (Zachary et al., 2015) reveals evidence that metal silo technology is effective against main storage pests and that its adoption can significantly improve food security in rural

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