



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

**FACULTY OF ENGINEERING
DEPARTMENT OF CHEMICAL AND PROCESS
ENGINEERING**

**DESIGN, CONSTRUCTION AND SIMULATION OF A SMALL-SCALE GRAIN
STORAGE SILO**

By

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**A final year project report presented in partial fulfillment of the requirements for the
award of the degree of bachelors of Agro-processing engineering of Busitema
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Abstract:

Storage is part of the farming system and is necessary for keeping and maintaining grains to ensure household food supply. The practices of traditional grains storages made of grass, wood, and mud in developing countries cannot guarantee protection against major storage pests such as rodents, insects, and birds(Yusuf & He, 2011).

The importance and objectives of this study is to design an economic and effective small scale grain silo to help small scale farmers on preventing grains post-harvest losses. As we all know, small scale agriculture, in particular, is the key to sustainable growth and equitable wealth generation in the developing world. This work will provide the methods to enable farmers store their grains safely so that the quality of the grain will be maintained up to the time of sale, processing for consumption or sowing for next season.

The prototype of the silo for the hermetic storage of cereals was designed and built at the Department of Chemical and Processing Engineering of Busitema University. The silo is planned specifically to be used in Uganda, by individual farmers operating in the inland areas of the country and small organized farmer groups. The silo can be used as an alternative of the local granaries, cribs and other local storage methods to eliminate the disadvantages associated with the local storage methods like rodent susceptibility, insect infestation, fire outbreaks in homes etc. Nevertheless, with a capacity of 500Kg, they can be considered suitable for several Ugandan local areas. Except for some details that require local blacksmith workshops, the users can self-build the silos. The possibility to use materials and equipment normally available on site is included among the criteria to take into account during the design phase. For example, corrugated galvanized iron, employed by the local population as cover for houses, can be considered a suitable material, as well as Angle section bars, traditionally used in Ugandan rural areas. To demonstrate the reliability of the design and the functionality of the adopted solutions, the silo was built in the workshop, using only simple tools available almost anywhere, all this makes the hermetic Silo cost-effective, simple and strong to suit small and middle scale grain producers.

The hermetic small scale silo for storage of grains was successful designed, fabricated and its performance tested using solid works software. The materials used were tested and where need for substitution of material is needed, is recommended. The user of the silo is advised to fix the whole structure on ground to increase its stability and avoid thieves.

The adoption of this storage method by local farmers will help them save about 30% of the stored products which could be lost to rodents, molds and other post-harvest losses. This will improve the income of the farmers and will eventually transform them from subsistence production to commercial production.

Declaration

I Ndererimana Robert do declare that this project work is my original effort and has never been produced in part or whole for any academic award in any university, college or institution of learning.

NDERERIMANA ROBERT

Date.....

Signature.....

Approval

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

Mr. Shaffic Ssenyimba

Signature.....

Date.....

Dedication

I dedicate this final year project report to my dear Dad, Mr. Sebadel Daniel. Am very proud of you and without you I would not have reached this far. May God bless you abundantly.

To my lovely mum, Mrs. Sebadel Maria, I really appreciate your support and care.

Acknowledgement

My sincere thanks goes to the Almighty God for giving me strength, good health, wisdom, and protection throughout the preparation of this work.

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List of acronyms

ASME American society of mechanical engineers

FAO Food and Agricultural Organization

HS Hermetic Storage

MA Modified Atmosphere

ARO Agricultural Research Organization

IRRI International Rice Research Institute

ACRS Air-conditioned storage

CRS Cold room storage

PVC Poly Vinyl Chloride

CO₂ Carbon dioxide

FFA Free fatty acids

APC Agricultural Policy Committee

WFP World Food Programme

UNARS Uganda National Agricultural Research System

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