

**BUSITEMA  
UNIVERSITY**  
*Pursuing Excellence*

**FACULTY OF ENGINEERING  
DEPARTMENT OF MINING & WATER RESOURCES ENGINEERING  
B.SC. WATER RESOURCES ENGINEERING FINAL YEAR PROJECT**

**INVESTIGATION INTO THE USE OF COW DUNG AS A PARTIAL REPLACEMENT OF  
CEMENT IN MORTAR.**

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## **Abstract**

Sustainability is important to the well-being of our planet, continued growth of a society, and human development. However, the steadily increasing cost of cement has made concrete, mortar and other cement products, very expensive particularly in developing countries, this has necessitated the need to intensify the search for supplementary cementitious materials for utilization as partial substitute for cement. This research project presents the results on the study of the pozzolanic potentials of cow dung. Cow dung was sun-dried, ground using a rubber pestle then sieved through 600 $\mu$ m sieve. The sample was tested for physical and chemical properties such as loss of ignition and sieve test. The test results revealed that cow dung contained 76.65% as silica content, 2.13% as Alumina content. Cement paste and mortar were produced using Cow dung as cement replacement at 0, 5%, 15% and 20%. Standard consistency, soundness and workability tests were conducted on the blended cement paste. Test results revealed that adding cow dung to cement, requires more water content by increasing the dung content. The result also reveals that incorporation of cow dung decreased the expansion from 2.2mm (for control sample) to 0.65mm (for 15% cow dung). For workability, the results show that the slump decreases with increase in the amount of Cow dung which indicates that more water is required to maintain the same consistency as the Cow dung content increases while compressive strength test was conducted on the hardened mortar cubes after curing for 7, 14, and 28 days. Addition of cow dung to cement paste increased standard consistency, while the compressive strength decreases with increase in cow dung and increase with curing age.

## **Declaration**

I Sebba Joshua declare that the work presented in this project proposal is as a result of my own research and has never been submitted to any institution of higher learning for any award whatsoever.

Signature.....

Date.....

## **Dedication**

This research is dedicated to my parents Mr. Kabogozza James and Mrs. Kabogozza Jacklyn.

## Approval

This proposal on the investigation of the effectiveness of cow dung used as a partial replacement of cement in mortar has been written under the supervision of;

### Main supervisor

Mr. Lwanyaga Joseph Ddumba

Signature .....

Date.....

## Acknowledgement

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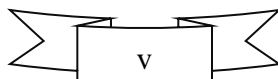


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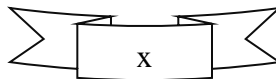
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## Acronyms

ASTM- American Standard Test Methods

BCR- Benefit Cost Ratio

BS- British Standards

CCA-Corn Cob Ash

IS- Indian Standards

LOI- Loss of Ignition

NPV- Net Present Value

OPC- Ordinary Portland Cement

PPC- Portland Pozzolana Cement

SAI- Strength Activity Index

SCM- Supplementary Cementitious Materials

WA- Wood Ash

## Chapter one

### 1.1 Background

Portland cement is a basic ingredient of concrete, mortar and most non-specialty grout (Rayaprolu and Raju, 2012). Most of the developed countries, such as South Africa, Canada and Nigeria are stumble upon with the problem of construction materials shortages because of the continuous increase in population and demand for new construction works. Besides its relevant to mention that concrete is the world's most consumed man-made material used in construction works (Naik, 2005). It is well known that sustainable development, one of the most important issues in the world at present days, involves to build our communities in such a way that we can all live comfortably without consuming all of our resources, we make an impact on the environment through how we survive our lives (Rayaprolu and Raju, 2012)

As time goes by, human civilization is continuously becoming more industrialized. More factories are built, vehicles are continuously growing in number, and buildings were built all around. As a result of these, our natural environment was permanently changed from what it has been twenty years or more. (Elaiyarasu, Dhaarani and Jagateesh, 2015). Uganda's cement production increased to 1.66 million metric tons (Mt) in 2011 from 1.35 Mt in 2010. Hima Cement Ltd completed the expansion of its capacity to 850,000 metric tons per year from 350,000 t/yr. Tororo Cement Ltd accounted for a substantial majority of national cement production; the company was planning to increase its capacity to 2.2 Mt/yr from 1 Mt/yr. (Bermúdez-Lugo, 2013).

Cow dung was habitually used in concrete and so one may suppose there were particular benefits in its inclusion. Recent publications suggest that dung may improve workability and durability or may act as an additional binder. Knowledge has also been lost as to whether fresh, old or weathered dung was used. Since there is no historic reference to the dung being old or weathered, I based my research on the effectiveness of utilizing dried cow dung as an admixture in cement. In any case, dried and fresh dung differ mainly in the water content and

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