

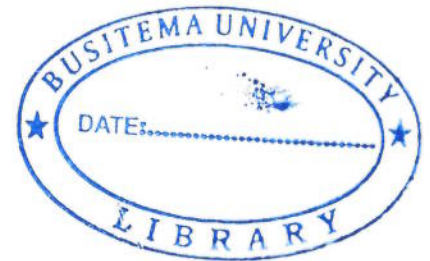
BUSITEMA UNIVERSITY
Faculty of Natural Resource and Environmental Sciences

**SUGARCANE CARBON SEQUESTRATION POTENTIAL
UNDER THE CLEAN DEVELOPMENT MECHANISM**

THE CASE OF KAKIRA SUGAR ESTATES

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BU/UG/2010/253



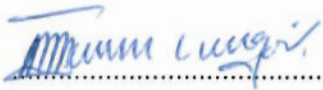
Supervisor: Assoc. Prof. Moses Isabirye

**A Research report submitted to the Faculty of Natural Resource
and Environmental Sciences in partial fulfillment of the award
of the degree of Bachelor of Science in Natural Resource
Economics of Busitema University**

JUNE 2013

Declaration

I, Sekajugo John do hereby declare that this research work has been through my own efforts and never has it been submitted to Busitema University or any other Institution of higher learning for the award of a degree or any other qualification.


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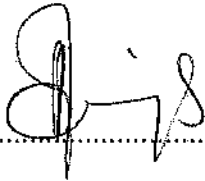
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Approval

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Dedication

To the Almighty father for protection and guidance he has granted me throughout my period of study. I glorify his name.

Also to my dear father Mr. Birungi Joseph and my two beloved mothers, Mrs. Namayanja Sarah and Mrs. Nansaale Harriet. Without their care, support and advise, I would not have come to the completion of this course.

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Acronyms

| | |
|--------------------------|--|
| AG | Above ground |
| acc-SMD | accumulated Soil Moisture Deficit |
| BIO | Microbial biomass |
| BG | Below ground |
| CPRS | Carbon Pollution Reduction Schemes |
| CO ₂ | Carbon dioxide |
| C | Carbon |
| CERUs | Certified Emission Reduction Units |
| CDM | Clean Development Mechanism |
| cm | Centimeter |
| COMESA | Common Market for East and Southern Africa |
| CERs | Certified Emission Reductions |
| C _T | Total carbon |
| C _F | Fraction of Carbon |
| C _{stock total} | Total carbon stock |
| C _{ag} | Above ground Carbon |
| C _{bg-biom} | Carbon in below ground biomass |
| C _{bg} | Below ground Carbon |
| C _{soil} | Carbon in the soil |
| CV | Co-efficient of Variation |

| | |
|------|--|
| DOEs | Designated Operational Entities |
| DNA | Designated National Authority |
| DPM | Decomposable Plant Material |
| D | Density |
| EPA | Environmental Protection Agency |
| EU | European Union |
| Evap | Evaporation |
| FYM | Farm Yard Manure |
| FAO | Food and Agricultural Organization of the United Nations |
| g | gram |
| GM | Green Manure |
| GMP | Green Manure Productivity |
| GHGs | Green House Gases |
| Ha | hectare |
| HUM | Humified Organic Matter |
| IOM | Inert Organic Matter |
| IPCC | Intergovernmental Panel for Climate change |
| Km | Kilometer |
| Kg | Kilogram |
| KSW | Kakira Sugar Works |
| Ltd | limited |

| | |
|----------------|--|
| LULUCF | Land Use, Land Use Change and Forestry |
| LUT | Land Use Type |
| MW | Mega watts |
| M | Meter |
| Max-SMD | Maximum Soil Moisture Deficit |
| M ³ | Cubic Meter |
| NFA | National Forestry Authority |
| Ppp | Parts per million |
| PoA | Plan of Activities |
| PDDs | Project Design Documents |
| RPM | Resistant Plant Material |
| SOC | Soil Organic Carbon |
| SOM | Soil Organic Matter |
| Sq mi | Square mile |
| SMD | Soil Moisture Deficit |
| SOMNET | Soil Organic Matter Network |
| STDEV | Standard Deviation |
| t _c | tons of cane |
| Tc/ha | Tons of carbon per hectare |
| TSMD | Total Soil Moisture Deficit |
| USA | United States of America |

Abstract

Soils, and managed agricultural soils in particular, represent a potentially significant low cost sink for greenhouse gases (GHGs) with multiple potential co-benefits to farm productivity and profitability (Jonathan, Ryan and Jeffrey, 2010). The great majority of agronomists and soil scientists agree that most agricultural soils can store more carbon and even a modest increase in carbon stocks across the large land areas used for agriculture would represent a significant GHG mitigation.

Sugarcane accompanied with good farming practices has the potential to sequester considerable amounts of carbon and so contribute to climate change mitigation. However, little has been done to provide relevant information concerning carbon sequestration in crop lands and sugarcane in particular. This research work focuses on finding out the ability of sugarcane to sequester carbon in the soil and involves analyzing four different sugarcane varieties among those grown by Kakira sugar works limited to assess their potential to sequester carbon. It is believed to provide the management of Kakira and other stakeholders the relevant information against which to base decisions for developing CDM projects to mitigate climate change through agriculture. Sugarcane grown in Kakira estates has the potential to sequester carbon between 589.11 to 591.12Tc/ha.

Therefore, with proper agronomic practices, carbon sequestration in sugarcane is a potential CDM project.

Key words: Carbon sequestration, sugarcane varieties, soil organic carbon, phytoliths, Bulk density

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Policy makers in Uganda, and many other nations, are currently debating how to design, implement and monitor carbon pollution reduction schemes (CPRS) as an important tool to reduce greenhouse gas emissions. Biospheric carbon offsets including soil carbon sequestration have the potential to be important components of any CPRS but numerous uncertainties still exist, especially within the agricultural sector, which are major barriers to effective policy implementation.

Soils, and managed agricultural soils in particular, represent a potentially significant low cost sink for greenhouse gases (GHGs) with multiple potential co-benefits to farm productivity and profitability (Jonathan, Ryan and Jeffrey, 2010, Lal 2004a; Pacala and Socolow, 2004). The great majority of agronomists and soil scientists agree that most agricultural soils can store more carbon and even a modest increase in carbon stocks across the large land areas used for agriculture would represent a significant GHG mitigation. However, currently, there is much uncertainty and debate, particularly within Australia, as to the total potential of soils to store additional carbon, the rate at which soils can store carbon, the permanence of this carbon sink, and how best to monitor changes in soil carbon stocks.

Throughout this research, I will primarily discuss the technical potential, defined by the biophysical conditions of the system, for agricultural land to store additional soil organic carbon (SOC) through improvements in management. It is very important to realize that this technical sequestration potential will likely never be fully realized due to a whole host of economic, social and political constraints

1.2 Soil carbon

Soil carbon sequestration is gaining global attention because of the growing need to offset the rapidly increasing atmospheric concentration of carbon dioxide (CO₂). This carbon dioxide enrichment is associated with an increase in global warming potential and

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