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BUSITEMA UNIVERSITY, ARAPAI CAMPUS

FACULTY OF AGRICULTURE AND ANIMAL SCIENCES

DEPARTMENT OF CROP PRODUCTION AND MANAGEMENT

VARIABILITY OF SOIL PHYSICAL AND CHEMICAL PROPERTIES ACROSS LAND PRODUCTIVITY CLASSES IN BANANA PLANTATIONS IN KABAROLE DISTRICT

BY

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BU/UG/2018/1983

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RESEARCH PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF CROP PRODUCTION AND MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE IN BACHELOR OF SCIENCE IN AGRICULTURE AT BUSITEMA UNIVERSITY

MAY 2023

DECLARATION

I, Asiimwe Solomon, declare that this Research Report is entirely my own work and that it has not been submitted at any University or Higher Institution of Learning for any academic award.

Signature: 

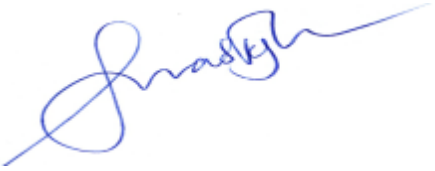
Date: 9th June, 2023

APPROVAL

This research project report has been written by Asiimwe Solomon under my supervision. I therefore approve and forward it to the Department of crop production and management for final assessment.

Dr. Wasige John

Date: 10th June, 2023

Signature: 

DEDICATION

I dedicate this work to my mother, Atwijukire Justine, for her relentless support throughout my course, the encouragement and financial support to carry out this research project.

ACKNOWLEDGEMENT

I would like to acknowledge the unconditional support, guidance and time of my academic supervisor Dr. Wasige John and support from my parents. I also thank my classmates who helped me with insights and gave me confidence and courage throughout my course and the preparation of this research project report.

Also, sincere thanks to the entire management and staff of Busitema University Arapai campus who tirelessly helped throughout this academic journey. MAY GOD BLESS YOU ALL ABUNDANTLY.

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ABSTRACT

Management practices such as mulching, intercropping, manuring/fertilizer application, water conservation, weeding, gap filling and so on affect the quality of soils and the crop productivity of farms. Assessing the soil physiochemical properties and subsequent implications on soil fertility is essential for understanding the influence of management practices on agricultural soil quality and the productivity on farms. This study, assessed the effect of management practices on selected soil properties and yield and the state of soil quality under banana plantations across sub-counties of Bukuku, Karangura and Kicwamba in Kabarole district - Uganda. The study site was stratified into land productivity classes based on tonnes of bananas per acre per farmer that is; increasing productivity, stable productivity, stable but stressed productivity, slightly declining productivity and declining productivity. Soil sampling and socio-economic analysis were conducted in each of banana land productivity classes. Basing on mean soil texture percentages, the soils across the study area can be classified as sandy clay loam, fine soils. The analysis of variance for selected soil properties under different productivity classes didn't show statistical significance at $P<0.05$. There was a statistical significance ($P<0.05$) in yield of banana plantations under different productivity classes across the study area. The yield was highest in increasing and stable productivity classes averaging at 4.033 tonnes of bananas/acre compared to the rest of the productivity classes which averaged at 1.16 tonnes/acre. Nitrogen and Potassium were higher in increasing productivity and stable classes, moderate in stable but stressed productivity class and slightly declining productivity, and lowest in declining productivity class. The exchangeable cations, i.e., sodium was generally constant across the productivity classes. Magnesium was increasing across the productivity classes from increasing to stable to stable but stressed to declining productivity classes though it was lowest in slightly declining productivity class. Calcium followed the same trend like of magnesium. Soil pH was highest in slightly declining productivity class (pH=6.66) and lowest in increasing productivity class (pH=6.48). Soil organic matter (SOM) was highest in increasing, stable and stable but stressed productivity classes averaging at 6.2% and lowest in slightly declining and declining productivity classes averaging at 2.865%. In conclusion, the results showed soil that soils in increasing and stable productivity classes were generally superior to the rest of the productivity classes. The results from regression models and analysis of variance also showed that management practices significantly influenced the yield on the plantations.

CHAPTER 1: INTRODUCTION

1.1 Background

Global level of natural resources and environmental problems have promoted the awareness of a need for sustainable development. Agriculture is among the top human activities that alters the global environment to the greatest extent (European Commission, 2022). Thus, sustainable development must inevitably deal with sustainable agriculture (FAO, 2022). Sustainable agriculture implies an agricultural system that can be maintained in a steady-state over time and able to continually provide food and other resource to a growing population (Velten et al., 2015).

Soil is the fundamental resource for nearly all land uses, and the most important component of sustainable agriculture (Nambiar et al., 2001). Therefore, assessment of soil quality, and its direction of change with time is an ideal and primary indicator of sustainable agricultural land management (Lal, 2016). Changes in land cover density and intensification of agriculture aggravate the leaching rate of soil organic matter and nutrients (Alam et al., 2017) and an accelerated rate of land degradation (Zajícová & Chuman, 2019). The cliché is also true, for example, integrated management of arable soil is the key to deal with most complex soil properties, thereby maintaining the land cover dynamics (Alam et al., 2014).

Soil fertility is becoming a concern, and more and more communal land is both privatized and converted to cash crop production and the fertility of Ugandan soils has been on a whole decline. The Reconnaissance Soil Survey of Uganda (Chenery, 1960) identified soils with higher than moderate productivity and soils with low or nil productivity. The distribution of these is detailed in (Jameson, 1970). Based on earlier soil analytical work, one could expect soil acidity, low organic carbon content, nitrogen, phosphorous and exchangeable calcium (Ca^{2+}) as factors likely to limit soil productivity. This was indeed confirmed by soil fertility research work at the time (Webb, 1954; Dept. of Agric., 1955). Foster, (1970) reported yield response to lime and potassium fertilizer for several crops in Uganda. Aluminum and Manganese toxicities were also observed in some soils (Foster, 1970; Stephens, 1970). Data from recent soil tests at Kawanda soil analytical laboratories show pH values as low ~s 3.3, and exchangeable calcium, Mg^{2+} and K^{+} values of 4.0, 0.5 and 0.2, respectively, on soils from Kabale district. Organic carbon levels as low as 0.2 % have also been observed on soils from Kyengera, Mpigi district; organic matter is associated with many

OTHER ADDITIONAL PAGES

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