BUSITEMA UNIVERSITY

FACULTY OF NATURAL RESOURCES AND ENVIRONMENTAL SCIENCES

DEPARTMENT OF NATURAL RESOURCE ECONOMICS

ASSESSING THE IMPACTS OF PLANTATION AGRICULTURE TO BELOW GROUND BIODIVERSITY. A CASE STUDY OF KAWERI COFFEE PLANTATION LTD. MUBENDE DISTRICT.

BY

ABIINE PAUL

BU/UG/2015/112

SUPERVISOR: PROFESSOR MOSES ISABIRYE

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF BACHELOR OF SCIENCE DEGREE IN NATURAL RESOURCE ECONOMICS OF BUSITEMA UNIVERSITY.

JUNE 2018

DECLARATION

I, AbiinePaul 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.

.....

ABIINE PAUL

Candidate

Date: 18/07/2018.....

APPROVAL

This is to confirm that research report titled assessing the impacts of plantation agriculture to below ground biodiversity. A case study of Kaweri coffee plantation ltd Mubende district. Is original and has only been through the efforts of Mr. Abiine Paul after pursuing a three year Bachelor of Science degree in natural resource economics of Busitema University. He has therefore fulfilled part of his requirements for the award of the degree in natural resource economics of Busitema University.

Supervisor:

.....

Professor: MOSES ISABIRYE

BUSITEMA UNIVERSITY

Date: .....

DEDICATION

I AbiinePaul, dedicate this research report to my parent Mrs.karuhanga maudah. My brother Aine Robert. My sister Asingwire Sarah. My friends AheirweDenis, Sunday Christopher, Nabukenya Dorah, and Ampeire peter, Elizabeth, Ronald, Deogratius, Happy and Macris. My supervisor professor Moses Isabirye and Kaweri coffee plantation ltd officials. May the almighty GOD reward you abundantly.

ACKNOLEDGEMENT

I thank the almighty GOD for the gift of life granted to me over the time of my study at Busitema University. I humbly thank my mother Mrs.karuhanga maudah for her tirelessly parental support including guidance and the heart of forgiving given to me over this course and lastly I thank her for being the number one financial supporter during my academic struggle. May the almighty GOD keep you alive with good health and peace as you wish.

To my brother Aine Robert and my sister Asingwire Sarah for their moral support and prayers and financial support towards my studies.

To my friends Aheirwe D, Muhangi N, Ampire P, Christopher S, Nabukenya .D. for your advices, financial support, academic guidance and good wishes to me. May the almighty GOD reward you as you wish

To my research supervisor professor Moses Isabirye for the well done supervision work, guidance and academic knowledge provided to me during my research period. May GOD give you more academic knowledge and bless you abundantly.

I also thank the entire administration of Busitema University for granting me opportunity to be one their students at bachelor level. To all lecturers of Busitema university faculty of natural resources and environmental sciences for their academic knowledge given to me over the period of three years. May God reward you abundantly.

I also extend my thanks to the administration of Kaweri coffee plantation ltd for granting me opportunity to conduct my data collection within the premises of the plantation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

BGB	Bellow ground biodiversity
CA	Conservation agriculture
FAO	Food and agricultural organization
IPCC	Inter governmental panel for climate change
KCPL	Kaweri coffee plantation limited
LTD	Limited
MA	Millennium ecosystem assessment
NFA	National forestry authority
SOM	Soil organic matter
SPSS	Statistical package for social scientist

ABSTRACT

The increased demand of fuel, fodder, charcoal, settlement, infrastructure and agricultural products among others has caused a great threat to forests leading to their depletion hence affecting the bellow ground biodiversity by reducing their abundance. The conservation of BGB has the potential to enhance soil fertility, reduce erosion, improve water availability, enhance biodiversity, increase aesthetics, and sequesters carbon (Garrity, 2010). Hence soil ecosystem services are improved. The study brings out the abundance and availability of BGB as the objectives states since the ecosystem services within the soil rely on them. The study was done in Kaweri coffee plantation ltd in Mubende district. Purposive sampling was considered to determine the sampling population. Only the blocks within the coffee plantation that have coffee trees with agrarian trees and natural belts were investigated. The BGB sample points were of 30cmx30cm stretch and 20cm deep for studying the availability and abundance of the BGB. The study considered only two land use that is coffee plantation and natural belt. Under coffee plantation, three positions were considered that is under coffee trees, under natural trees within the plantation and under bare land. The dominant soil organisms in Kaweri coffee plantation include; termites, black ants, millipedes, earthworms, snails, caterpillar and spiders and the abundance of these species is 642, 494, 230, 221, 149, 42 and 36 respectively. It was discovered that most of the soil organisms are found under the natural trees left in the coffee plantation or planted (482) followed by soil organisms under coffee trees (470)and least under bare land (388) within the coffee plantation.

It was also discovered that under land use, coffee plantation is having more soil organisms (1340) due to the favourable conditions compared with the bio-corridors or natural belt (47 I therefore recommend that for the soil organisms to be conserved in the agricultural systems, agro forestry should be practiced more since most of the soil organisms are found under agrarian trees within the farm. And bare grounds should be avoided in the plantation since they support few soil organisms. Covering plants like indigofera should be emphasized in the plantation as well as organic farming.

CHAPTER ONE

1.1 Introduction

The biggest numbers of people are unaware of ecosystem services that biodiversity provide especially to enhance crop performance and improvement of people's livelihood. Uganda lost 27 percent (1,329,570 hectares in total or 88,638 hectares per year) of its original forest cover between 1990 and 2005 according to national forestry authority report (2009). The increased demand of fuel, fodder for animals, charcoal burning and agricultural expansion among others has caused a great threat to trees leading to their depletion hence affecting the bellow ground biodiversity. At this rate of demand, forest resources a likely to be exhausted by 2050 according to(National forestry authority, 2009). This has left the environment degraded with less resilience to provide the social needs of the community such as; fodder, fuel and various ecosystem services like climate regulation, biological regulation, soil formation and regeneration ((ME), 2005)that biodiversity offer to foster the cropping systems. The conservation of biodiversity has the potential to enhance soil fertility, reduce erosion, improve water availability, enhance biodiversity, increase aesthetics, and sequesters carbon (Garrity, 2010)

Biological resources management is essential and everyone is affected by ecosystem degradation, the poor rural who have no access to land which is the most essential pillar of human livelihood and national development in Uganda are disproportionately affected (Ministry of lands, 2009). With the low adaptability of the rural farmers to biodiversity conservation, the researcher considers the farmers to be less knowledgeable about the different ecosystem services the biodiversity provide, there is fairly abundant information on ecosystem services provision within the agricultural systems, but comparatively little information regarding how farmers manage their trees within their gardens, the factors influencing their farming practices and the extent to which farmers' local knowledge is exposed to global scientific understanding and management decisions. Since they are largely dependent on the local ecological resources with the trees inclusive, climate sensitive economic activities such as subsistence agriculture are very directly affected by the way in which these environmental resources are exploited.

Questions have been left unanswered as to what value biodiversity are to the community and agricultural. There are questions regarding the environmental and economic values of ecosystem values of ecosystem services (Raudsepp-hearne, 2010) offered by biodiversity. Most people are unaware of the

REFERENCES

National forestry authority. (2009). . *National biomass study report.* kampala.

(ME), M. e. (2005). Ecosystem and human wellbeing. Washington.

al., R.-H. C. (2010). Untangling the environmentalist's paradox: why is human wellbeing increasing as ecosystem services degrade? Bioscince.

Araya, T. C. (2011). Effects of conservation agriculture on run off, soil loss and crop yield under rain fedconditions in tigray.

Assessment, M. E. (2006). *Ecosystems and Human Well-Being: Synthesis.* . Washington DC.

Brauman, K. A. (2007). The nature and value of ecosystem services: an overview highlighting hydrologic services. Annual Review of Environment and Resources,.

Buck, L. T. (2007). Scientific Assessment of Eco agriculture systems. Washington DC.

Cardinale, B. D. (2012). Biodiversity loss and its impact on humanity.

Daily, G. M. (1997). Ecosystem services supplied by soil.

Daily, G. T. (2000). The value of nature and the nature of value .

FAO. (2006). *Water for Food Water for Life – A comprehensive Assessment of water management in agriculture.*

Garbach, K. L. (2012). Payment for ecosystem services: The roles of positive incentives and information sharing in stimulating adoption of silvopastoral conservation practice. Agriculture, Ecosystem and Environment.

Gardiner, M. L. (2009). Landscape diversity enhances biological control of an introduced crop pest in the north-central USA. Ecological Application.

Garrity, D. a. (2010). Ever green agriculture: a robuster approach to sustainable food security in africa.Food security.

GOU. (2010). *Government of uganda.*

Greenpeace. (2008, January). *Cool farming: climate impacts of agriculture and mitigation potential.* Retrieved from www.greenpeace.org/raw/ content/international/press/reports/cool-farming-full-report.pdf

Haggar J., B. M. (n.d.). *coffee agro ecosystem performance under full sun, shade, conventional and organic management regimes in central america. agro forestry systems.*

Haines-young, R. a. (2013). *Common international clasification of ecosystem services (CICES): consultation on version 4, August-December 2012.*

Halweil, B. (2006). *Can organic agriculture feed us all?* World Watch.

Harvey, C. M. (2006). Patterns of animal diversity in different forms of tree cover in agriculture and land scapes. Ecological Applications.

Holmes, K. (2001.). *Inexhaustible Appetites: Testing the Limits of Agro ecosystems. earth trends.*

Holt-Gimenez, E. (2002). Measuring farmers' agro ecological resistance after Hurricane Mitch in Nicaragua: A case study in participatory, sustainable land management impact monitoring.

Hooper, D. C. (2005). Effects of biodiversity on ecosystem functioning: A consensus of current knowledge. Ecological Monographs.

In F. Magdoff and R. Weil (eds. (n.d.). Soil Organic Matter in Sustainable Agriculture. CRC Press;. 1-43.

JAFOLEY. (2005). *global consequencies of land use.*

Jeroem, H. (2013). *Managing soil biodiversity to enhance agriculture productivity* . international institute for tropical agriculture (CIAT) presentation.

Kremen, C. N. (2007). Pollination and other ecosystem services produced by mobile organisms.

Kremen, C. O. (2005). A call to ecologists: Measuring, analyzing, and managing ecosystem services. frontiers in Ecology and Environment.

Lin, B. (2007). Agro forestry management as an adaptive strategy against potential microclimate extremes in coffee agriculture.

Magdoff, F. L. (1997). Nutrient cycling, transformations, and flows: implication for a more sustainable agriculture.

Majanen, T. F. (2011). *Innovations in market-based watershed conservation in the united states.* Washington DC.

Ministry of lands, h. a. (2009). National land policy. kampala.

Mosier, A. J. (2004.). *Agriculture and the Nitrogen Cycle:Assessing the impacts of fertilizer use on food production and the environment.*

Naeem S., D. B. (n.d.). Biodiversity, Ecosystem Functioning, and Human Wellbeing: An ecological and economic perspective. UK.

NDP. (2010/2011-2014/2015). *National development planning.* kampala.

Ong, C. B. (2006). Modifying forests and agroforstry for improved water production in semi arid tropics.

Pimentel, D. (2006). Soil erosion: a food and environmental threat. Environment, Development, and Sustainability.

power., S. (2008). *Social-Economic Impacts of Unsustainable population Growth.*

rapidel., B. (2011). *Ecosystem services from agriculture and agroforestry. Measurement and payment.*

Raudsepp-hearne, C. e. (2010). *Untangling the Environmentalist's Paradox: Why is human well-being increasing as ecosystem services degrade.*

rockstrom, J. (2009). *Ecology and society : Planetary boundaries: Exploring the safe operating space for humanity.*

TEE. (2010). *The economics of ecosystems and biodiversity: Mainstreaming the economics of nature: A synthesis of the approach, conclusion and recommendations of TEEB.*

UBOS. (2010). *Uganda bureau of statistics.*

water, U. (2013). *United nations water conservation.*

Water, U. (2013). *United water conservation.*

Weil, R. and Magdoff, F. (2004). *Significance of soil organic matter to soil quality and health.*

Zhang et al. (2007). *The role of autophagy in mitochondria maintenance: characterization of mitochondrial functions in autophagy-deficients.*