BUSITEMA UNIVERSITY
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FACULTY OF NATURAL RESOURCES AND ENVIRONMENTAL SCIENCES

DEPARTMENT OF NATURAL RESOURCE ECONOMICS

THE POTENTIAL IMPACTS OF CLIMATE CHANGE AND CLIMATE VARIABILITY ON ARABICA COFFEE PRODUCTION: A CASE STUDY OF TINGEY COUNTY IN KAPCHORWA DISTRICT, UGANDA

By

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ABSTRACT

The study was conducted in the Tingey county Kapchorwa district in Uganda aimed at assessing the effect of climate change and climate variability on Arabica coffee production. The objectives of the study were to assess the effect of climate change and climate variability on coffee production under the current and predicted climatic conditions of precipitation and temperature; to assess the adaptation techniques that farmers are applying and to assess the determinants of farmer's choice of adaption techniques.

To achieve these objectives, the study assessed the historical and forecasted precipitation and temperature patterns under the three emission scenarios of RCP 2.6, RCP 4.5 and RCP 8.5. Questionnaires and key informant interviews were employed to gather information on farmer's adaptation techniques to the impacts of climate change and determinants of farmer's choice of adaptation techniques.

Gridded datasets of observed and modelled rainfall and temperature data from Climate Research Unit (CRU) and Coordinated Regional Climate Downscaling Experiment (CORDEX) were used to assess the historical and forecasted patterns of rainfall and temperature.

The research findings reveal that climate change will negatively affect coffee production. Temperature will increase by 0.5^0C for RCP 2.6, 1.7^0C for RCP 4.5 and 4.6^0C for RCP 8.5. Such temperature changes will lead to coffee flower abortion, early ripening of coffee beans and areas suitable for the growth of coffee will reduce. Arabica coffee farmers could be forced to move up the mountains for favourable temperatures and this will in turn affect the quality of Arabica coffee and farmers could also be forced to switch to the production of other cash crops.

Results also indicate that farmers are employing different techniques to adapt to climate change. 41.07 percent of the respondents use intercropping as an adaption technique followed by agroforestry at 34.40 percent.

In conclusion, climate change and climate variability will negatively affection Arabica coffee production in Tingey County, Kapchorwa District.

DECLARATION

I, Kato Phillip declare that this research is my own original work done within the period of registration and that it has never been submitted for a degree award in any other institution.

Signed: ..... Date: .....

Kato Phillip

CANDIDATE

APPROVAL

This is to confirm that this research report is original and has only been through the efforts of **Kato Phillip** after pursuing a Master of Science in Climate change and Disaster Management of Busitema University. He has therefore fulfilled part of his requirements for the Award of the Master's Degree in Climate change and Disaster Management of Busitema University, Uganda.

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DEDICATION

This dissertation is dedicated to my family for they gave me conducive time at home that enabled me give time to my studies.

To my father Joshua Baino-Komire (RIP) and my mother Nalongo Amooti Regina.

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ABBREVIATIONS

^0C	Degrees Celsius
CCKP	Climate Change Knowledge Portal
CH_4	Methane
CO_2	Carbon dioxide
CORDEX	Coordinated Regional Climate Downscaling Experiment
CRU	Climate Research Unit
CW	Climate Wizard
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gases
GIS	Geographic Information Systems
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
IRI	International Republican Institute
LDC	Least Developed Countries
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
Masl	Meters above sea level
MNL	Multinomial logit model
MWE	Ministry of Water and Environment
NAPA	National Adaptation Programme of Action
NEMA	National Environment Management Authority
OWC	Operation Wealth Creation
Ppm	Parts per million
RCM	Regional Climate Model
RCP	Representative Concentration Pathway
UBOS	Uganda Bureau of Statistics
UCDA	Uganda Coffee Development Authority
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development

CHAPTER ONE: INTRODUCTION

1.0 Introduction

In this chapter, we present background to the study, the major and specific objectives, research questions, statement of the problem, justification and significance of the study and the conceptual framework.

1.1 Background to the Study

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as a variation between normally experienced climate conditions and a different, but recurrent, set of climate conditions over a given region of the world over a period of 30 (thirty) years (IPCC, 2001). The key cause of climate change is the burning of fossil fuels, these lead to the increase in greenhouse gases (GHG) such as carbon dioxide (CO2) and Methane (CH_4) content of the atmosphere that weaken the ozone layer leading to global warming (IPCC, 2001).

There is strong evidence that suggests that climate is changing such as increase in global land surface temperatures, melting of ice on mountain Rwenzori, more frequent droughts, unpredictable rainfall patterns, and many more. Agriculture which is a backbone of Uganda's economy is predominantly rain fed and is highly vulnerable to climate change and climate variations. Over 80% of Uganda's population is rural and 73% of the working population are employed in agriculture and related activities (MAAIF, 2010).

Studies by the International Food Policy Research Institute (IFPRI) have showed that increased floods and droughts increase the likelihood of short-run crop failures and long-run production declines in both crops and animals (IFPRI, 2009). If left unchecked, climate change is expected to lower global per capita Gross Domestic Product (GDP) by 20% by 2200, threatening global food security (Stern, 2010).

High yields in Arabica Coffee is linked to climate, and is thus strongly influenced by changes in climate (Sys et al., 1993). The stated optimum mean annual temperature range for Arabica is 16–22 degrees Celsius. At temperatures above 22 degrees Celsius, development and ripening of fruits are accelerated, often leading to the loss of beverage quality (Carmago, 2010) although in some locations higher temperatures 24 to 25 degrees

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