ANALYSIS OF CLIMATE SMART AGRICULTURAL PRACTICES IN MAIZE PRODUCTION AMONG SMALLHOLDER FARMERS IN EASTERN UGANDA

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I**, Babinga Geofrey**, declare that this thesis is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for examination by Busitema University a dissertation titled: ***Analysis of CSA Practices in the Maize Production among Small Holder Farmers,*** The case Study of Eastern Uganda, in Partial fulfillment of the requirements for the degree of Master of Science in Climate Change and Disaster Management of Busitema University**.**

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DEDICATION

I dedicate this work to the Babinga Family, farther, Brothers, Friends, and to my siblings:-Destiny, Shillah, Bridget, Allan, Elvis and Darwin.

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LIST OF ACRONYMS /ABBREVIATIONS

CSA	Climate Smart Agriculture
UBOS	Uganda Bureau of Statistic
ACDP	Agricultural Cluster Development Project
USAID	United Stated Agency for International Development
UBOS	Uganda Bureau of Statistics
GDP	Gross Domestic Product
FAO	Food and Agriculture Organization
SSA	Sub Saharan African
UNFCCC	United Nations Framework Convention on Climate Change
SDG	Sustainable Developmental Goals
MDGs	Millennium Developmental goals
NARO	National Agricultural Research Organization
UNHDR	United Nations Human Development Report
GoU	Government of Uganda
SAPs	Sustainable Agricultural Practices
WFP	World Food Program
NEMA	National Environment Management Authority
PHH	Post Harvest Handling
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
IPCC	Intergovernmental Panel on Climate Change

OPERATIONAL DEFINITION OF TERMS

Aflatoxins: Poisonous substances produced by fungi and make the grain unfit for consumption.

Climate change: Natural and or human induced changes in the mean and/or the variability of climate properties and that persists for an extended period, typically decades or longer (Intergovernmental panel on climate change, 2007).

Climate change adaptation: Adjustments in ecological-social-economic systems in response to actual or expected climatic stimuli, their effects or impacts (IPCC, 2001; Smit& Olga, 2001).

Climate Smart Agricultural practices: FAO Defined CSA as agricultural activity that is: sustainably and efficiently increases productivity and incomes (adaptation), reduces or removes Greenhouse gases emissions (mitigation), enhances achievement of national food security and development goals (FAO, 2010).

Climate Smart Agricultural strategies: a group of related (in terms of use) climate smart agricultural practices.

Climate Smart Agricultural packages: a combination of climate smart agricultural strategies used by farmers in the study area.

Vulnerability: having "an external dimension, which is represented by the exposure of a system to climate change variations, as well as an internal dimension, which comprises it's „sensitivity and its adaptive capacity" to these stressors" (Füssel & Klein, 2006).

Small scale farmers: farmers who own 5 acres or less living and practicing farming in the region.
Post-harvest damage: physical alteration caused by biotic or a biotic agents.

Quality loss: a reduction in the quality of food grain so that its market value is reduced transaction attributes, including nutrition, food security, and product safety

Food security: when all people at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" World Food Summit 1996

Climate change adaptation: initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects.

Vulnerability: the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes.

Risk: the probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. It results from the interaction between the hazard (weather event), exposure (system that can be affected) and the vulnerability.

Gender differentiated vulnerability to climate change impacts: Gender is one of many components of vulnerability to climatic change. Changes in the climate affect genders differently, magnifying existing gender inequality.

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ABSTRACT

Climate change remains a major threat to maize production and food security as well. The increasing temperatures, drought stress, disease and pest outbreak followed with variability in rainfall partners has had serious consequences on crop production in the region thus fostering a decline in production resulting into food insecurity. Climate Smart Agriculture (CSA) is the way to turn around the situation to more resilience and higher agricultural productivity leading to improved food security status. Multistage sampling technique was employed in sampling 240 maize small holder farmers in the region. The Primary data was collected through face-to-face interviews using structured and open ended questioners to interview the respondents. With the application of principal component analysis, we clustered the CSA practices into 4 components: crop management, field management, and farm risk reduction and soil management practices.

The CSA practices were grouped using a Principal component analysis (PCA) and a Regression analysis was used in analyzing the effect of CSA practices on maize yield. The factors that influences the demand for CSA practices were determined in a poison regression analysis, Multinomial Endogenous Switching Regression was employed in analysis. Multicollinearity and heteroskedasticity were conducted to the variables for socio-economic, institutional and climate related factors.

The results revealed that 14 individual CSA practices which were grouped into four components actively in use. The results indicated a strong positive correlation between the Maize yield and the CSA practices. The results also showed that demand for CSA practices was positively influenced by gender of the household head, household size, and participation in off-farm employment, farm size, group membership, and annual contacts with extension service agents, credit access and negatively influenced by age of the household head. A complete package with crop management, field management, farm risk reduction and specific soil management practices had the highest implication on maize production, food security and determine and propose the best adoption options for maize production. Farmers should be sensitized on the need to invest in farm productive assets in order to absorb the risks of climate change while also enabling them to benefit from use of CSAs which require these important assets.

CSAs have the potential to alleviate food insecurity among smallholder farmers if used in combinations and to a larger extend.

Keywords: Climate-smart agricultural practices, Food security, Climate change, Smallholder farmers, Multinomial endogenous switching regression analysis.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Uganda's ever increasing population largely depends on natural resource based sectors such as agriculture, fisheries and forestry. Here agriculture is the most important economic activity, providing income, employment and foreign exchange and the sector contributes 23.7 per cent of the Gross Domestic Product (GDP) Uganda Bureau of Statistics (UBOS 2011/12) and 80 per cent of national export earnings Food and Agricultural Organization (FAO).Agricultural production systems are expected to produce food for the global population that is expected to reach 9.1 billion people in 2050 and over 10 billion by end of the century (World bank, 2011) According to (Branca et al, 2011) agricultural systems need to be transformed to increase the productive capacity and stability of smallholder agricultural production in the wake of climate change. This change has already caused significant impacts on water resources, human health and food security (Turpie et al, 2002); (Hassan,Deressa T,, 2005); (Nhemachema,C & Hassan, 2007); (Deressa et al, 2005) (Kabubo-Mariara & Kabara M, 2011, 2015)Rising temperatures and changes in rainfall patterns affect agricultural production with significant decline in crop and livestock production. The agricultural sector is dominated by food crop production such as maize, millet, Banana, cassava and to a less extent potatoes. Maize's importance is associated with increasing demand by the Uganda's population for food security, industrial demands, income, livestock sector and its associated products and yet Smallholders Farmers dominate the production process of the enterprise. It is an important source of carbohydrate, protein, iron, vitamin B, and minerals and consumed as a starchy base in a wide variety of porridges, pastes, grits, and beer. Green maize (fresh on the cob) is eaten parched, baked, roasted or boiled and plays an important role in filling the hunger gap after the dry season.

Maize grains have great nutritional value as they contain 72 % starch, 10 % protein, 4.8 % oil, 8.5 % fibre, 3.0 % sugar and 1.7 % (Chaudhary, 1983)Zea mazy is the most important cereal fodder and grain crop under both irrigated and rain fed agricultural systems in the semi-arid and arid tropics (Hussan et al,, 2003)Climate change is a threat to food security systems and one of the biggest challenges in the region. There is growing evidence that climate change is real and has potential devastating consequences on small holder farmers in the region. Significant concerns about the impacts of climate variability and change on agricultural production have been raised in

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