Adoption of Climate change Mitigation Measures: A case of Biogas Utilization in Bugisu sub Region, Eastern Uganda

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DECLARATION

I Ongwen Amos hereby declare that the contents of this thesis are out of my own efforts and that all authors that I used to build up this piece of work were clearly acknowledged in text and in references. No similar work has ever been done and submitted to any institution of higher learning for any academic award.

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Date: 23/09/18

APPROVAL

I hereby approve that the information in this research book is a result of efforts by the student in the names of Ongwen Amos. The compilation was done gradually with my gradual supervision as the assigned university supervisor.

Dr. ALICE NAKIYEMBA

Date: 24/09/2018

DEDICATION

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ABSTRACT

Climate is changing at an alarming rate. Warming of the climate system is evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level. The study aimed to assess the extent to which biogas use is an alternative energy source to climate change mitigation in Bugisu sub region. The specific objectives of the study were to; Explore the contributing factors to climate change in Bugisu sub-region, Find out the various climate change mitigation measures present in the Bugisu sub region, Establish the contribution of biogas use to climate change mitigation in Bugisu sub region and Examine the factors affecting the use of biogas as a climate change mitigation measure in Bugisu sub region. The study applied both quantitative and qualitative methods of data collection. Quantitative data were collected through questionnaires distributed to 300 respondents selected purposively from Bugisu sub region. The qualitative data were collected from technocrats (councilors and environmental/ Natural resources officer). The findings of the study show that Industrialization, Overgrazing, Poor environmental planning, Deforestation, Poverty, Slash and Burn, were found to be the contributing factors to climate change in Bugisu sub-region and then mining activities and use of fertilizer do not contribute significantly to climate change. Renewable energy technologies and afforestation are significant mitigation measures to climate change while Hydroelectricity, Land use change and Solid waste management have no significant use effect in climate change mitigation in Bugisu sub region. Biogas was found to be an alternative to fuel wood and charcoal and led to a reduction in the rate of deforestation in Bugisu sub region. It was also observed that biogas use has got enormous contribution to climate change mitigation. It leads to a reduction in GHG, its ecofriendly and produces high quality organic fertilizer in form of bioslurry. When well maintained, biogas reduces wastes taken to landfills. Finally additional work to operate the biogas and inadequate feedstock were found to affect the use of biogas in Bugisu sub region. High maintenance cost and installation cost, smell, cultural taboo, limited awareness, and biogas not being economically viable, Biogas plant failures do not affect biogas use in Bugisu sub region. The study recommends that; basic training in biogas technology should be introduced to vocational institutions, research in alternative feed materials for biogas and stake holder involvement in promotion and marketing of biogas have been proposed to increase biogas uptake in the region and beyond.

LIST OF ABBREVIATIONS/ACRONYMS

FAO	Food and Agricultural Organization
GHGs	Green House Gases
ICAR	India Agricultural Research Institute
IPCC	International Policy on Climate Change
IR	Infrared
KW/h	Kilowatts per hour
NGO	Non-Government Organization
O & M	Operation and Maintenance
RETS	Renewable Energy Technologies
TOTs	Trainers of Trainees
UDBP	Uganda Domestic Biogas Programme
UV	Ultraviolet Rays
WCN	World Carfree Network
WWF	World Wildlife Fund

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Climate is changing at an alarming rate (Snyder, 2017). Warming of the climate system is evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level (IPCC, 2007). Over the three decades, greenhouse gases (GHGs) have increased by an average of 1.6% per year, Atmospheric CO_2 concentrations have increased by almost 100 ppm in comparison to its preindustrial level, reaching 379 ppm in 2005 (Cornejo and Wilkie, 2010). The GHGs are responsible for increase in earth temperature (Sue, (2015) and very instrumental in the increased record of global surface temperature since 1850. The 100-year linear trend (1917- 2017) of 0.74^0C is observed as too high (Alani *et al.*, 2017).

Similarly precipitation pattern from 1900 to 2005 changed significantly (Easterling, 2017). In Indian sub-continent, temperatures are predicted to increase between 3.5^0C and 5.5^0C (Singh *et al.*, 2011). African summer temperatures increase is predicted to increase by 2050 at about 1.5^0C above the 1951–1980 baseline and remain at this level until the end of the century (Muvhiiwa, 2017). In the high-emission scenario RCP8.5 (representing a 4^0C world), warming continues until the end of the century, with monthly summer temperatures over Sub-Saharan Africa reaching 5^0C above the 1951–1980 baseline by 2100 (Serdeczny *et al.*, 2017).

In 2016, Arua and Jinja had the lowest mean daily minimum temperatures while Gulu had the highest mean daily minimum temperature (IrishAid, 2017; UBOS, 2017). In Nepal, observed data indicate the consistent warming and rise in the maximum temperature at an annual rate of $0.04\text{-}0.06^0$C and projected to increase by 1.2^0C by 2030 compared to a pre-2000 baseline, and Precipitation pattern also changing differently in different region of the Nepal (Chand, Upadhyay and Maskey, 2012). In sub Saharan Africa the rise in the maximum temperature at an annual rate of 0.06 -0.071^0C and projected to increase by 1.4^0C by 2030 (Kuya, 2016; Authority, 2017) and the same applies to countries that lie below the equator line Uganda inclusive (World Food Programme, 2016).

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