DECLARATION

I, **Kabwe Harnadih Mubanga**, do hereby declare that, with the exception of quotes and information done by others, which I have made reference to and duly acknowledged herein, this dissertation has been written and compiled by me and the work recorded is as a result of my own research. The dissertation has not been previously submitted for a degree, diploma or any other qualification at this or any other University.

December, 2012

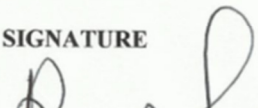
Signature: 

Date: **21/12/2002**

CERTIFICATE OF APPROVAL

THIS DISSERTATION OF KABWE HARNADIH MUBANGA HAS BEEN APPROVED AS PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF SCIENCE DEGREE IN GEOGRAPHY BY THE UNIVERSITY OF ZAMBIA.

SIGNATURE **DATE**



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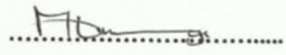

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ABSTRACT

This study was conducted in Choma within the Agro-Ecological Region II (AER II) with Mbabala and Singani being the study sites. The aim was to assess climatic variations, adaptation measures and coping strategies by small-scale farmers in Agro-Ecological Region II (AER II) for the purpose of ensuring viability of small-scale arable agriculture. Archival rainfall and temperature data for the periods 1910 to 2009 and 1945 to 2009, respectively, were obtained from the Zambia Meteorology Department (ZMD) while qualitative data on recommended maize varieties was collected through interviews with private seed breeders including ZAMSEED, SEEDCO, PANNAR and MRI SEED. A total of 112 randomly sampled small-scale farmers from Mbabala and Singani areas were interviewed on their adaptation measures, coping strategies as well as their preferred maize varieties. Climate variability was assessed by the use of the Coefficient of Variation (CV) which was applied to the archival rainfall and temperature data. ANOVA was used to determine the significance of the observed variability from the calculated CVs while regression analysis was used to determine the annual rates of temperature and rainfall changes. In order to come up with the most suitable of the recommended maize varieties for the region, qualitative data were analyzed according to themes relating to adaptability to climatic variations, disease resistance, drought tolerance as well as potential yields.

Analysis of collected data revealed that AER II had experienced significant changes in received rainfall and experienced temperatures over the period 1910 to 2009 for rainfall and 1945 to 2009 for temperature. The Southern part of Western Province (Sesheke) showed the highest rainfall and temperature variations while Eastern Province (Chipata) exhibited high rainfall and temperature variability. Mongu and Kaoma in the northern Western Province experienced the lowest rainfall and temperature variation. All the towns in AER II experienced increased rainfall and temperature variability after the 1980s. The annual rate of rainfall change was found to range from -3.01mm/year (Kalabo) to 0.79mm/year (Chipata) giving an average annual rate of rainfall decrease of -1.09mm/year. The annual rate of temperature change ranged from 0.005ºC/year (Senanga) to 0.04ºC/year (Monze) giving an average annual rate of temperature increase of 0.023ºC/year for AER II. The characteristics of the recommended maize varieties according to selected themes revealed that while ZAMSEED's ZMS 606, SEEDCO's SC 525, PANNAR's 6966 or 6823 and MRI Seed's MRI 514 would be good seeds to plant, ZAMSEED's ZMS 616 was the most suitable for the AER II considering its adaptability to a range of climatic conditions, disease resistance, drought tolerance and high potential yield. As a way of adapting to extreme climatic conditions the small-scale farmers used early maturing and drought resistant maize varieties as well as substitute and complementary crops and they coped by diversifying their livelihoods to include charcoal production, gardening and trading.

Overall, it is concluded that AER II experienced significant climatic variations during the study period but that characteristics of maize varieties used by farmers were not all attuned to climate variability. Maize variety ZMS 616 was strongly recommended for use by farmers in AER II. More efforts on adaptation to climatic variation in AER II are required to help farmers adopt conservation agriculture as a long-term measure to reduce adverse impacts of whims of nature in their livelihoods.

DEDICATION

To my lovely wife Annie

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I wish to express my sincere thanks to Dr. Henry M. Sichingabula who was my supervisor during the course of my Masters programme. I valued and will continue to value the comments and insight into the research which he rendered. The time he spent reviewing my document has been very precious to me as it has helped me in producing this dissertation. I further wish to thank Dr. Joseph Kanyanga for the assistance he rendered especially in the collection of archival rainfall and temperature data from the Zambia Meteorological Department (ZMD).

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ACRONYMS AND ABBREVIATIONS

AER	:	Agro-Ecological Region
AERs	:	Agro-Ecological Regions
AER I	:	Agro-Ecological Region I
AER II	:	Agro-Ecological Region II
AER III	:	Agro-Ecological Region III
ANOVA	:	Analysis of Variance
B.P	:	Before Present
CA	:	Conservation Agriculture
CF	:	Conservation Farming
CFU	:	Conservation Farming Unit
CO2	:	Carbon Dioxide
CCFU	:	Climate Change Facilitation Unit
CSO	:	Central Statistics Office
CV	:	Coefficient of Variation
CVs	:	Coefficient of Variations
FAO	:	Food and Agriculture Organization
FRA	:	Food Reserve Agency
FSP	:	Fertilizer Support Programme
GHG	:	Green House Gases
GRZ	:	Government of the Republic of Zambia
Gt	:	Giga tone which is equivalent to 10^9 metric tons (1 billion metric tons)
GtC/$GtCO_2$	:	Units for measurement of GHG e.g. Carbon Dioxide, Methane etc. An emission of 1 GtC corresponds to 3.67 $GtCO_2$.
IPCC	:	Intergovernmental Panel on Climate Change
ITCZ	:	Inter-Tropical Convergence Zone
MACO	:	Ministries of Agriculture and Cooperatives
MET Station	:	Meteorological Station
MM	:	Mount Makulu Maize Varieties

MRI	:	The Maize Research Institute
MTENR	:	Ministry of Tourism, Environment and Natural Resources
NCLS	:	Northern Corn Leaf Spot
NGOs	:	Non-governmental Organizations
NISIR	:	National Institute for Scientific and Industrial Research
PAM	:	Programme Against Malnutrition
PAN	:	Pannar Maize varieties
PANNAR	:	Pannar Seed Company
PPFD	:	Photosynthetically Photon Flux Density
PPM	:	Measurements of Carbon Dioxide concentrations (Parts per Million)
SADC	:	Southern African Development Community
SAP	:	Structural Adjustment programme
SC	:	SEEDCO Maize varieties
SCRB	:	Soils and Crop Research Branch
SEEDCO	:	Seed Company
SE	:	Standard Error of Mean
SST	:	Sea Surface Temperatures
StDev	:	Standard Deviation
UNEP	:	United Nations Environment Programme
UNFCCC	:	United Nations Framework Convention on Climate Change
UNZA	:	The University of Zambia
WFP	:	World Food Programme
ZARI	:	Zambia Agriculture Research Institute
ZASTA	:	Zambia Seed Trade Association
ZAMSEED	:	The Zambia Seed Company
ZMD	:	The Zambia Meteorology Department
ZMS	:	ZAMSEED Maize varieties.