CLIMATE VARIABILITY, GENDER RELATIONS AND NUTRITIONAL STATUS OF CHILDREN AND ADULTS IN RUDEWA VILLAGE, TANZANIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN RURAL DEVELOPMENT OF SOKOINE UNIVERSITY OF AGRICULTURE.

MOROGORO, TANZANIA.

2014
ABSTRACT

The study was conducted to examine gender relations and nutritional status of children and adults in Rudewa-Mbuyuni Village, Kilosa District as influenced by climate variability. A face to face interview was conducted using questionnaires to obtain data from 158 respondents. Three focus group discussions were held to supplement the information captured through interviews. Anthropometric measurements of height, weight and Mid Upper Arm Circumference were performed to assess the Body Mass Index (BMI) of household members as a nutritional status indicator. The BMI of 124 children (52 boys and 72 girls) was assessed. The 24-hour dietary recall technique was used to assess household food consumption. Data was analyzed using the IBM Statistical Package for Social Sciences (IBM SPSS) software. About 73% of the respondents were male and 27% were female. Most respondents were within the age range of 20 to 60 years (73%), 75% were married, about 86% owned a house and 93% were farmers. Food shortage was experienced by 82% of households with 60% purchasing food for consumption during the farming season. Most respondents (88%) were aware of climate change and linked it with changing rainfall and temperature regimes, and 74% indicated that climate variability had great impact on food production. The BMI for adult respondents (70%) was normal, 10% were underweight, 20% were either overweight or obese. About 15% of the boys and 8% of the girls were overweight and 12% of boys and 8% of girls were underweight. There is evidence that the majority of households in Rudewa-Mbuyuni do not meet their daily nutritional requirements due to food shortages induced by erratic rainfall, linked to climate change; with differential impacts on nutrition status across gender groups.
DECLARATION

I, MARIANA L. NGOWI, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within a period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

Mariana L. Ngowi
(MARD Student)

Date

The above declaration is confirmed

Prof. J. Kinabo
(Supervisor)

Date
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ACKNOWLEDGEMENTS

I would like to express my gratitude to the Almighty GOD for HIS blessings throughout this study for without him nothing could be possible. I will always praise and seek HIS divine power in whatever I do.

Profound gratitude is due to my supervisor Prof. Joyce Kinabo for her guidance, suggestions, constructive criticism and devotion which has been a key to the success of this work. I have learnt a lot from her and without her support and advice this work could have not been completed. I am also highly grateful to Dr. P. Mamiro, Mrs T. Jumbe, S. Msollo, J. Ntwenya and Laurent Mselle - staff members of the Department of Food Science and Technology – SUA for their various contributions towards this research work. Special thanks are also conveyed to Mr. Mikidadi Muhanga and Prof. Kim Kayunze of the Development Studies Institute (DSI) – SUA for the critical review of my thesis.

I acknowledge the financial support the Eco-Health Project provided to undertake this study. Sincere thanks also go to the administration and staff of Kilosa District for their assistance during the data collection period.

I owe heartfelt gratitude to my parents; Mr and Mrs. Roman Ngowi, Mrs. Tenslaus Ngowi, brothers James, Erick and Peter, Sisters Rosada, Rose, Farida and Flora for their unfailing confidence in me and their support over many years through ups and downs. They have been my constant source of inspiration. My niece Faith and Neria were a source of joy whenever I came home tired after long hours in the field.
I would be unfair to my conscience if I fail to acknowledge the warmth of my classmates and friends Zawadi Kitemangu, Jacqueline Ndosi, Anna G. Monela, Pascal Katona, and Aviti Archard. You were always there for me in my overall academic endeavors at SUA.

Lastly but not least, I would like to acknowledge my beloved one Jacob K. whose generosity and collective efforts contributed towards the achievement during my whole period of study. I really value your support – GOD BLESS YOU ALL!
DEDICATION

This work is dedicated to my beloved parents the Late Mr Lucas Ngowi and Mrs Anna Hendry who laid the foundation of my education. Also to my late uncle Raphael Ngowi, who had been very supportive throughout this study period. May their souls rest in peace!
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<tr>
<td>AfDB</td>
<td>African Development Bank</td>
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<tr>
<td>BMI</td>
<td>Body Mass Index</td>
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<tr>
<td>CC</td>
<td>Climate Change</td>
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<td>FGD</td>
<td>Focus Group Discussion</td>
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<td>FN</td>
<td>Food and Nutrition Policy</td>
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<td>GBV</td>
<td>Gender-based violence</td>
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<td>HHs</td>
<td>Households</td>
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<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<tr>
<td>IDDS</td>
<td>Individual Dietary Diversity Score</td>
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<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
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<td>ILO</td>
<td>International Labour Organization</td>
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<td>IPCC</td>
<td>International Panel on Climate Change</td>
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<td>KDC</td>
<td>Kilosa District Council</td>
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<td>MDGs</td>
<td>Millennium Development Goals</td>
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<tr>
<td>MKUKUTA</td>
<td>Mkakati wa Kupunguza Umasknina Kukuza Uchumi Tanzania</td>
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<tr>
<td>MUAC</td>
<td>Mid Upper Circumference</td>
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<tr>
<td>NBS</td>
<td>National Bureau of Statistics</td>
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<tr>
<td>NGOs</td>
<td>Non Government Organization</td>
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<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>NSGD</td>
<td>National Strategy for Gender Development</td>
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<td>NSGRP</td>
<td>National Strategy for Growth and Reduction of Poverty</td>
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<td>PRB</td>
<td>Population Reference Bureau</td>
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<td>SD</td>
<td>Standard Deviation</td>
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<td>SPSS</td>
<td>Statistical Package for Social Science</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>SSA</td>
<td>Sub-Saharan Africa</td>
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<td>SUA</td>
<td>Sokoine University of Agriculture</td>
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<tr>
<td>TDV</td>
<td>Tanzania Development Vision 2025</td>
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<tr>
<td>TNBOS</td>
<td>Tanzania National Bureau of Statistics</td>
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<tr>
<td>URT</td>
<td>United Republic of Tanzania</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNCN</td>
<td>United Nations Council for Namibia</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<tr>
<td>UNSCN</td>
<td>United Nations Standing Committee on Nutrition</td>
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<td>WHO</td>
<td>World Health Organization of United Nations</td>
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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Climate change (CC) is a serious threat to food security and nutrition globally and in Africa (Pachauri and Reisinger, 2007; UNSCN, 2010), due to increased frequency of extreme weather events, such as floods and droughts amongst others (Mboera et al., 2011). In Tanzania, heavy rains, floods, and drought have caused widespread damage to farm crops and scarcity of clean safe water, resulting into food shortages and internal displacements of the populace. This has significantly contributed to malnutrition due to a declined food supply and increased disease transmissions especially among the rural population (Mboera et al., 2011). Food shortages compounded with limited livelihood resource base and limited social safety nets exacerbates food insecurity and negatively impacts the nutritional status of the rural population, leading to high incidences of malnutrition and nutritional related diseases. Nutritional interventions are necessary to reducing vulnerability and building resilience to climate change among the rural communities.

Climate change increasingly affects the livelihoods of people, and poor people especially who experience negative impacts due to lack of capacity to prepare for and cope with the effects of a changing climate. Women and men experience these impacts differently (Mitchell and Tanner, 2006).

Comprehensive approaches are needed to preserve and improve nutritional status of both men and women as affected by climate change in the short and long-term.
Adaptation and mitigation strategies to respond to climate change stresses the need for finance, technology, and capacity-building to reduce the impact of climate change and gender relations on nutritional status (UNSCN, 2010). Stresses on nutritional status due to the climate change effects promotes the need to consider how different groups are likely to be visited.

Gender inequality can aggravate the effects of climate change on the population and therefore gender-sensitive approaches are needed to bridge the gender gap as far as nutritional needs are required. However, there is a paucity of evidence on the specific linkages of climate change on gender relations and nutritional status. Understanding gender issues in the context of climate change effects and nutritional status of the population is essential in development planning which this study seeks to address. This is in line with The National Food and Nutrition Policy (FNP) which is nutrition policy this policy is guideline and aimed at giving the general conceptual and practical directions of nutrition policies and programmes with the ultimate goal of eliminating malnutrition. The guideline addresses the immediate, underlying and basic causes of the malnutrition problem.

1.2 Problem Statement

Climate change-induced under nutrition is a significant and widespread health and socio-economic problem in rural communities in Sub-Saharan Africa (SSA) (UNSCN, 2010; Fanjul et al., 2012), due to high dependence on environment-based livelihoods (Alexander et al., 2011). This greatly undermines current efforts to reduce hunger and promotion of nutrition improvement such as the Millennium Development Goals (MDGs) targeting of halving hunger by 2015 (UNSCN, 2010; Tirado et al., 2010). Efforts such as
MKUKUTA, *Kilimo Kwanza* which aimed at enhancing smallholder food production levels in rural Tanzania can only be attained if human capital is enhanced (URT, 2008).

A gender dimension to climate-induced nutritional status has been reported among various gender groups (men, women, girls, and boys). Though men and boys are typically affected, numerous studies have reported greater climate change impacts amongst rural women and girls with limited data for males.

Furthermore, few studies have been conducted on gender analysis in relation to climate change effects on nutritional status. This study therefore aimed at to examine the linkages between climate change and gender relations on nutritional status using Rudewa, Kilosa District as a case study.

1.3 Justification

The study is relevant as it is in line with Tanzania gender related policies like population policy, community development policy, child development policy as well as employment policy which all of them insist on gender mainstreaming which results in empowering women as well as vulnerable groups such as children and people with disabilities. Also, this study is very important for both women and men on the knowledge of potentiality of gender equity as it relates to all dimensions of development of the nation at large as it is embedded in international policy namely Millennium Development Goals (MDGs) particularly goal number three which puts emphasis on achieving gender equity in all aspects of development.

It is also in conformity with the National Strategy for Growth and Reduction of Poverty (NSGRP). The Tanzania Development Vision (TDV2025) as well as National Strategy
for Gender Development which are all together fighting against poverty through gender mainstreaming.

Furthermore, the findings of this study are important to policy makers, planners and other stakeholders who devote their time regarding gender as crosscutting issue in all aspects of development processes.

The current development paradigm for the developing countries such as Tanzania is to build adaptive capacity and greater resilience among the rural population by enhancing nutrition security. Engendered nutrition interventions can contribute to reducing vulnerability and building resilience to climate change consequences.

Gender nutrition divide has received limited attention in nutrition interventions. Gender-sensitive strategies are crucial to improve and create equality of the nutrition status among different social groups and sex. Hence a systematic study to enhance understanding on the linkages between climate change and gender nutritional status.

1.4 Objectives

1.4.1 Overall objective

To determine the linkage between climatic change, gender relations and nutritional status of rural communities in Rudewa Mbuyuni, Kilosa Tanzania.

1.4.2 Specific objectives

i. To examine extent of gender imbalance on nutrition status of household members.

ii. To examine household strategies used for adapting to the climate change impacts.
iii. To analyze the effects of climate change on gender relations at household and community levels

iv. To assess trends in climate variability over a period of thirty years

4.4.3 Research questions

The following research questions were used as a guide of the research process

(i) Does gender imbalance have an effect on nutrition status of household members?
(ii) Does gender imbalance affect strategies for adapting to climate change?
(iii) What are the effects of climate change on gender relations at household and community levels?
(iv) Are there any changes in climate over the past thirty years?

1.5 Conceptual Framework

The basic assumption for this study is that climate change affects nutritional status of the household members. It is further assumed that, individuals within communities are differently affected depending on the level of development as determined by both social and economic constructs. Thus factors such as sex, age, education and marital status are the background variables. These further modulate social economic, production and gender. The interplay between these factors further translates into individual nutritional status (Fig. 1)
Figure 1: Conceptual framework.
CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition of Key Terms

2.1.1 Climate change

Climate change (CC) can be defined as a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and that is in addition to natural climate variability over comparable time periods.

Climate Change is rapidly creating new conditions for development in poor countries primarily by inflicting increasing variability and uncertainty on the lives and livelihoods of their rural and urban populations and by increasing the frequency and intensity of natural hazards (Cannon et al., 2010).

Without adequate mitigation for adaptation to climate change its direct and indirect impacts will cause substantial damage to human well-being and prosperity. There is thus an emerging consensus that 'any effective development planning process' needs to take climate change into consideration (McGray et al., 2007).

With an increasing understanding of climate change as a development issue not only requiring scientific but also social, political, economic and behavioural solutions, the need to ensure these solutions are gender-responsive should be self-evident. As a scientifically proven, as global gendered phenomenon (IPCC, 2007), the impacts and perceptions of climate change vary at the local level, and they also vary between women and men, girls and boys.
Including both men and women in decision-making on climate change adaptation and mitigation, and understanding the reasons for and implications of their different roles, responsibilities and capabilities is, therefore, clearly essential for poverty reduction and gender equality as well as successful climate-resilient and low-carbon development. Moreover, when addressing global poverty, not taking both women and men, and girls and boys into account would mean neglecting a large part of the population whose well-being we seek to improve (Brody et al., 2008).

2.1.2 Climate variability

Climate variability can be defined as the way climate fluctuates yearly above or below a long-term average value. It can occur in a specific month, season or year, compared to the long-term climate statistics relating to the corresponding calendar period. It is where you can think of it as a story with two parts: average and range. These parts complement each other; understanding the range gives context to the average and vice versa. Changes in climate variability and extremes of weather and climate events have received increased attention in the last few years.

Scientists believed that extreme climate variability and climate is very difficult by interactions between the changes in the mean and variability (Meehl et al., 2000). Such interactions vary from variable to variable depending on their statistical distribution.

2.1.3 Nutritional status

Nutritional status is the balance between the intake of nutrients by an organism and the expenditure of these in the processes of growth, reproduction, and health maintenance. Nutritional status assessment can be measured for individuals as well as for populations. However, population measures are more important in research. They can be used to
describe nutritional status of the group, to identify population segments at risk of nutrition-related health illnesses). The nutrition status of an individual and the level of health resulted from the intake of food utilization in the body.

Nutritional status is the current body status of a person or a population group, related to their state of nourishment (the consumption and utilization of nutrients). It is determined by a complex interaction between internal/constitutional factors and external environmental factors: the internal or constitutional factors are like age, sex, nutrition, behavior, physical activity and diseases and external environmental factors are like: food safety, cultural, social and economic circumstances. The ideal nutritional status occurs when the supply of nutrients conforms to the nutritional requirements or needs.

The nutritional status of an individual has consequences because it has a powerful factor for health and well-being. It is a major, modifiable and powerful element in promoting health, preventing and treating diseases and improving the quality of life. Also, malnutrition may increase risk of (susceptibility to) infection and chronic diseases. Undernutrition may lead to increased infections and decreases in physical and mental development, and overnutrition may lead to obesity as well as to metabolic syndrome.

Main purpose of conducting nutritional assessment of an individual is to identify individuals or population groups at risk of becoming malnourished and to identify individuals or population groups who are malnourished. Also to develop health care programs that meet the community needs which are defined by the assessment and to measure the effectiveness of the nutritional programs & interventions once initiated. Therefore, nutrition status of an individual can be defined as the interpretation of information obtained from the nutrition assessment.
2.1.4 Gender

Gender refers to socially constructed roles and status of men and women, girls and boys and other socially vulnerable groups. It is a set of culturally specific characteristics and relationships defining the expected societal interaction or behaviour of women, men, boys and girls. It encompasses the economic, political, and socio-cultural attributes, constraints, and opportunities associated with being a male or a female. Gender roles and relations vary according to time, place, class, ethnic, religion, generations, and stages of the lifecycle of individuals.

Gender relations define the ways men and women interact with one another, with reference to the power relations between them. Gender equality refers to equal rights, responsibilities and opportunities of women and men, and girls and boys. Gender equality does not imply that women and men have to be the same, but that their rights, benefits, and opportunities will not depend on their sex orientation (IUCN *et al.*, 2010). Both gender equality and relations are historically specific and reinforced by social institutions. They influence how communities, households and institutions are organized, how decisions are made and how resources are used. In many places, gender aspects embody unequal power relations. It is therefore necessary to examine how gender influences access to and control over assets and decision making about resource use to enable rural households to climb out of poverty.

2.1.4.1 Gender and climate change

Gender issues in relation to climate change have been rarely addressed. Despite the guiding principle within the UN (United Nations) system to incorporate gender sensitive approach more research is needed to bridge the gap.
Women are affected differently compared to men and often more severely by climate change and associated natural disaster such as floods, drought and storms. This is because both men and women are bound by social economic roles and responsibilities that give rise to differences in vulnerability and ability to copy cope with these climate change consequences.

2.1.4.2 Climate change and impact on gender

Gender and climate change is no longer a largely unexplored area, but there are still wide knowledge gaps, particularly in areas where the specific impact of climate change on women and men is not immediately obvious. Civil society and international organizations working on gender have generated a range of new knowledge products that have discussed the gendered impact of climate change and disasters in sectoral areas perceived as most ‘directly’ affected by climate change, such as food security, agriculture or water, as well as mapping some more ‘indirect’ impacts on social sectors such as health and education. (Benjamin et al., 2013) However, the areas where gender dimensions appear less obvious such as transport and infrastructure, energy access, housing, and formal or informal employment are far less well explored (Otzelberger, 2011).

2.1.4.3 Linkage of climate change to nutrition status

Climate change has a great impact to Agriculture. African countries, agricultural production and nutrition status (including access to food) are likely to be severely compromised by climate change and climate variability. Most African countries are facing this challenge of agriculture (Boko, 2007). Small-holder agriculturalists are especially vulnerable to a range of social and environmental stressors such as population increase. IPCC AR4 estimated that 200–600 million more people will suffer from hunger by 2080. Calorie availability in 2050 is likely to decline throughout the developing world
resulting in an additional 24 million undernourished children, 21% more relative to a world with no climate change, almost half of which would be living in sub-Saharan Africa (Nelson et al., 2007; Parry et al., 2009).

Scientists are beginning to recognize climate change as an emerging risk factor for human health. A number of projected climate change impacts will have negative implications for human health. The health effects can be direct, such as extreme weather events like storms, floods, and heat waves, or indirect, such as changes in the ranges of disease vectors (e.g., mosquitoes), water-borne pathogens, water quality, air quality, and food availability and quality. Furthermore, the actual health impacts will be different for the coming decade. According to local environmental conditions, socio-economic circumstances, and the range of adopted social, institutional, technological, and behavioural measures.

2.1.4.4 Climate change and development

Climate change is a threat to sustainable development in Africa. The continent is home to the world’s most susceptible populations, because of the sensitivity and fragility of its natural environment, and its high rate of dependence on environment-based livelihoods. Adapting to climate change is on the international agenda, it is increasingly apparent that efforts have moved too slowly to prevent impacts which are already being felt in many parts of the world.

Africa is particularly vulnerable to the effects of climate change because of multiple stresses of climate change and low adaptive capacities of its population. This is due to arising from endemic poverty, complex governance and institutional dimensions; limited access to capital, including markets, infrastructure and technology; ecosystem
degradation; and disasters and conflicts (Boko et al., 2007; UNISDR, 2008). These in turn have contributed to Africa’s weak adaptive capacity, increasing the continent’s vulnerability to climate change. These changes are having a dramatic impact on food and nutrition security and health in Africa, and in particular, sub-Saharan Africa (Boko et al., 2007; Oxfam International, 2010; NOAA, 2011).

It would be hard to imagine a family in the developed world today spending one or more hours every day gathering biomass such as wood, agricultural residues, and dung, when they could instead buy cooking fuel for the same purpose at a price that reflects income from five or fewer minutes of work. Yet this is the burden of women in the developing world. The disproportionate amount of daily time and effort women and young girls spend gathering solid fuels and water for household chores could be used for other income-producing activities, family subsistence, or education.

A strong relationship exists between climate change and nutrition status which are closely linked to gender. Women, more than men, are exposed to environment linked risks. The geography, environmental fragility and dependence on low-technology, rain-fed agriculture that makes Africa vulnerable is at the heart of women’s livelihood.

Poor women’s predominant role in agriculture and environment related jobs heighten their risk; many are engaged in the informal sector, without the protection of formal labour market regulation. Gender inequalities and different gender roles, needs and preferences which vary over space and time influence the different ways in which young, adult and elderly males and females experience the impacts of climate change and develop strategies to adapt to or mitigate them. Therefore, any development programme or policy addressing climate change should be premised on the principle that neither the
impact pathways nor the responses to climate change are gender-neutral, and that a
gender-responsive approach is required from the outset.

The study points to the need for data to develop policies to mitigate the impact of climate change. It emphasizes the need to use tools already available to National Statistical Systems, rather than collect new data, by ensuring gender sensitivity in survey instruments. National Statistical Systems have a role in making information on the human environment available to policy-makers, advocates and stakeholders.

2.1.4.5 Enhancing community nutrition wealth social economic factors

Climate change and variability and the consequent global environmental changes and loss of ecosystem services will have significant impacts on food and water security and eventually on malnutrition, particularly in developing countries in the Sub-Sahara and in South East Asia (Confalonieri et al., 2007).

According to the International Panel on Climate Change (IPCC), “Africa is likely to be the continent most vulnerable to climate change. Among the risks the continent faces are reductions in food security and agricultural productivity, particularly regarding subsistence agriculture, increased water stress and, as a result of these and the potential for increased exposure to disease and other health risks, increased risks to human health” (Parry et al., 2007).

There is much talk of a water crisis, of which the most obvious manifestation is that 1.2 billion people lack access to safe and affordable water for their domestic use (WHO 2003). Water is a very complex resource. People in the rural areas that have an income below the one-dollar-per-day poverty line lack access to water for their daily use and
livelihoods. The lack of access to water has major impacts on people's well-being hence lack of access to safe drinking water and sanitation, combined with poor personal hygiene, causes massive health impacts, particularly through diarrhea diseases, estimated to cost the lives of 2.18 million people three-quarters of whom are children younger than 5 years old, annually, and an annual global burden of disease measured as 82 million Disability Adjusted Life Years (Pruss et al., 2002).

The risks associated with agriculture and climate change arise out of complex relationships between agriculture and the climate system. The interannual, monthly and daily distribution of climate variables such as temperature, radiation, precipitation, water vapour pressure in the air and wind speed can affects a number of physical, chemical and biological processes that drive the productivity of agricultural, forestry and fisheries systems (Tolba and Saab, 2009).

The major impacts of climate change include severe floods, frequent and prolonged droughts, rising sea levels, crop failure, loss of livestock, lower water availability and quality and an increase in vector and water-borne diseases (Githeko et al., 2000; Patz et al., 2005). Heavy rains, floods, drought and landslides in Tanzania have resulted into internal displacement, food shortages and increased disease transmissions. Drought itself has significantly contributed to malnutrition due to lack of adequate food, increased infectious diseases transmission and scarcity of clean and safe water (Kandji and Verchot, 2005). Landslides, droughts and floods are becoming common in Tanzania. These losses seriously affected women's ability to feed their families since they previously obtained a significant portion of their daily food from their own yards. In this, women are the main providers of food and meals for their families; women may bear a greater burden to fulfill this task when climate events occur.
Although the impacts of climate change are global, the most vulnerable are the poor and marginalized people from developing countries who depend most directly on their ecosystems for survival. These are the same people who have the least capacity to adapt to the rapid changes that are affecting their environment (WHO, 2008), without access to adequate safe water, adequate sanitation and lack access to land, credit or knowledge.

2.1.4.6 Linkage of climatic change on nutrition status

Vital links exist between climate change and nutrition because climate change slows progress towards gender equality and poses a challenge to poverty reduction efforts; on the other hand, gender inequality can further worsen the effects of climate change (AfDB, 2009). Climate change negatively affects nutrition through its impacts on health and vice versa. Climate change has an impact on water availability and quality, sanitation systems, food safety and on waterborne, food borne, vector-borne and other infectious diseases which eventually both increase nutritional needs and reduce the absorption of nutrients and their utilization by the body.

The impacts of climate change on nutrition and health will further aggravate the effects of the HIV pandemic, reducing the workforce dedicated to agriculture and the food supply. This is a great concern considering that most of the populations affected by HIV depend on agriculture for their livelihoods. Climate change also put further strain on the already heavy workload of women with negative impacts on their ability to provide proper care to infants and young children, heightening the risk of under nutritional. Climate change mitigation measures need to be put in place urgently in all the sectors, in order to reduce the impacts of climate change on food and nutrition security.
The agriculture sector substantially contributes to greenhouse-gas emissions worldwide and therefore offers a significant potential for mitigation. Mitigation strategies in the agriculture sector should be pro-poor and sustainable while avoiding compromising food and nutrition security. Many mitigation opportunities in this sector can enhance the adaptive capacity and sustainability of systems contributing to development.

Climate change and variability and the consequent global environmental changes and loss of ecosystem services will have significant impacts on food and water security and eventually on malnutrition, particularly in developing countries in the Sub-Sahara and in South East Asia (Confalonieri et al., 2007).

2.1.4.7 Climate change in Kilosa, Morogoro

In recent years (2009-2011), heavy rains accompanied with strong winds have left thousands of people displaced and without food in Muleba, Kilosa. The flooding of 2009/10 in Kilosa proved as serious that over three quarters of the farmers reported their households were affected. One-third of the households were displaced from their homes, with some still displaced two years later.

From the research it was found that women and children are most affected because due to the fact that men lost income from remunerated work on farms while women lost the fruits, vegetables, chickens, and ducks from their home yards which are the big source of food in the household.

Kilosa District like other regions in Tanzania has been experiencing periodic droughts and floods and these have been viewed by many as outcomes of climate change. As a result, food systems approaches are recommended as appropriate approaches for
improving nutrition and health status of people in these areas while simultaneously building resilience to climate change.

Plate 1: Floods in Kilosa February 2014
3.0 METHODOLOGY

3.1 Description of Study Area

The study was carried out in Rudewa Mbuyuni village, Kilosa District, Tanzania. Kilosa is one of the six districts forming Morogoro Region. The district is located 300 km west of Dar Es Salaam with a total area of about 14,245 km² lies between 6°S and 8°S, and 36°30'E and 38°E (Beidelman, 1960; KDC, 2010). It is bordered by Tanga Region to the North, Morogoro District to the East, Kilombero District and Iringa Region in the south (KDC, 2000). Kilosa District comprises mostly flat lowland that covers the whole of the Eastern part called Mkata Plains. (Nduwamungu et al., 2004). Kilosa experiences two rainy seasons; long rains (Masika) and short rains (Vuli). The long rains start in late March and last until early June and the short rains start from October to November.

Kilosa District has a population of about 438,175 people, with an average of 4.6 people per household. The major ethnic groups in this village are the Pogoro, Sagara, Kaguru, and Gogo. The minorities are Sukuma, Masai, Luguru, Hehe and Zigua (TNBOS, 2012). Agriculture is the key economic activity for the population within the district. Most people are subsistence farmers cultivating maize, cassava, sorghum of maize, pigeon peas, cassava, sorghum, rice and bananas. A number of households also keep domestic animals such as chickens, ducks and few goats. Pastoralism is also practiced by a section of the population. Other livelihood activities in the area are hunting, charcoal making, fishing and petty trade (Madulu, 2005). Food shortage months include February through March (lean season) while adequate food periods include July through September (harvest period).
Figure 2 shows the location of the study area (Rudewa Mbuyuni village). It is bordered by Rudewa Gongoni in the north and Twatwatwa in the east village and Madoto Ranch and Rudewa Sisal Estate in the south.

Figure 2: Location of Rudewa - Mbuyuni Village.
3.2 Research Design

A cross-sectional research design was used in collecting data. This study design was chosen because it has a greater degree of accuracy and precision in social science studies and can accommodate a large number of study units at low cost and in a short time (Kothari, 2004).

3.2.1 Sample size

The sample size for the study was 158 as determined by the population of Rudewa Mbuyuni Village. The village has 5 hamlets with a total of 820 Households. Households were randomly selected proportional to the population size in each hamlet involving all members of the households. Among selected households, children, boys and girls of the given household were taken anthropometric measurement to get the nutrition status of the entire household.

3.2.2 Sampling procedures

A systematic stepwise random technique was carried out to obtain the study village according to (Bailey, 1994). In this method, all districts were listed, assigned numbers and then Epi info computer software was run to select one District randomly in which Kilosa District was selected. All Divisions in Kilosa District were listed and assigned numbers and one division was randomly selection by using Epi-info software. In this case, Chanzuru division was selected. All villages in Chanzuru ward were listed and the Epi-info software was used to randomly select one village. Rudewa Mbuyuni village was selected.

Rudewa Mbuyuni village has five hamlets namely, Shuleni, Muungano, Kigenge, Makurunge and Mkoroshini. The hamlets comprise of 820 Households (HHs).
Households were selected randomly proportional to the number of households in each hamlet. The sample frame covered the five hamlets and households were selected proportional to population size in each hamlet and the total sample size of 158 households was obtained from each hamlet. Fig.3, (n=158)

![Diagram showing sample size distribution across hamlets](image)

**Figure 3: Sample size RudewaMbuyuni Village (n=158).**

### 3.2.3 Data collection

Data for this study included both primary and secondary data. Primary data were collected by using guided questionnaires, key informant were interviewed, focus group discussions were conducted, anthropometric measurements and a 24-hour dietary recall. Secondary data included weather data sourced from ARI Ilonga and SUA.

#### 3.2.3.1 Questionnaire survey

Face to face interviews were conducted using structured questionnaire. The questionnaire was pretested to refine the relevancy of the questions in the tool. Data collected included socio economic information such as age, marital status education level, occupation,
source of livelihood and household size. Information on activity pattern in relation to gender was also collected.

3.2.3.2 Assessment of dietary intake

Dietary intake was assessed by using 24-hour dietary recall technique. Respondents were asked to mention foods consumed in the 24 hour period prior to the day of the survey. The food frequency questionnaire was used to assess the frequency of foods consumed by participants per day/week/month. Also, information on food distribution, traditions governing distribution, taboos and food aversion in relation to gender was assessed.

Information on Individual Dietary Diversity Score (IDDS) was collected by asking the respondent a series of yes or no questions. These questions were asked to an adult who was present and ate food in the household the previous day. The questions refer to the household as a whole and also the IDDS of the household was assessed based on gender.

3.2.3.3 Key Informant Interviews and Focus Group Discussion (FGD)

A key informant interview was conducted to collect information on the historical perspective of climate change and the relations between women and men from the village elderly persons. Also the information on the climate scenario and how do they see it affecting livelihoods was collected. The instrument which was used during FGD is guided question see appendix 2. Sampled members a group of 8-12 were randomly selected from each group.
Plate 2: FGD for both females and males.

The aim of FGD was to supplement information collected from the questionnaires. Participants who attended the FGD included village chairman, village executive officer, agriculture extension officer, health officer, and primary health workers, religious leaders, community leaders and elders. Three different groups (Women, men and both men and women) participated in the Focus Group Discussion.

3.3 Assessment of nutrition status

Nutrition status was assessed using anthropometric variables (weight, height and mid upper arm circumference (MUAC)) measured through standard techniques and equipment. Anthropometric indicators of weight-for-height, weight-for-age were used to assess the nutritional status of children while body mass index (BMI) and MUAC were used to assess the nutritional status of the adult subjects.
3.4 Measurement procedures for anthropometric variables

3.4.1 Weight measurement

The weight of the subject was measured by using an electronic scale (SECA, Hamburg, German). The scale was adjusted to zero before each subject was weighed. The subjects were asked to remove their shoes and wear light clothing. Reading was taken and recorded for each subject to the nearest 0.1 kg. Child aged 2-19 years were asked to stand upright with their arms hanging loosely at his/her sides and the weight was recorded. (Gibson, 1990). For children below two years of age, the weight of parent or guardian was recorded, then the scale was tarred to zero while standing. Thereafter, the child was handed to the parent to get the weight of the child. The weight of the child was recorded to the nearest 0.1 kg.

Plate 3: Anthropometric measurement
3.4.2 Height measurement

The height of the subject was measured by using the Shorr Potrabke Infant/Child/Adult Height/Length measuring board (Shorr Production, USA). Before taking the length, the stadiometer was positioned on a hard flat surface, and with the mother’s help the child was placed on the board facing upward with the head towards the fixed end and the body parallel to the long axis of the board. Child’s knees pressed onto the board such that the legs are straight and the toes point directly upwards, the movable footboard was then brought to rest firmly against the heels and the measurement was taken to the nearest 0.1cm (Gibson, 1990).

3.4.3 Body Mass Index (BMI)

The BMI index was calculated using equation 1. The index was then used to describe the nutrition status for adults into classify the individual’s nutrition status into classes by using cut-off points. Following guidelines by WHO, (2004) and Bowman (2001) BMI were calculated by using the equation below.

\[
BMI = \frac{\text{Weight of individual in Kg}}{\text{Height of an Individual in m}^2}
\]

<table>
<thead>
<tr>
<th>Interpretation</th>
<th>BMI cut off points Kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt; 18.5</td>
</tr>
<tr>
<td>Normal</td>
<td>18.5-24.99</td>
</tr>
<tr>
<td>Overweight and obesity combined</td>
<td>≥25-29.99</td>
</tr>
<tr>
<td>Obese</td>
<td>≥30-34.99</td>
</tr>
</tbody>
</table>


The nutrition status of children of age 5.1 - 19 years was determined by using BMI for age. The BMI for the child < 5 years were calculated, by then using the BMI for age
(WHO, 1995). The medium of the child with the same age was obtained. Lastly, the formula below was used to calculate the nutrition status of the child.

\[ Z\text{-score} = \frac{\text{observed value} - \text{median reference value}}{\text{Standard deviation (SD) of reference population}} \]

3.5 Activity Pattern in Relation to Gender (who does what)

This information on activity pattern was primarily concerned with on-farm activities, household activities and community activities as whole. Members were asked general questions with regards to their activity patterns.

3.6 Data Analysis

Both qualitative and quantitative statistical techniques were applied in the data analysis. Data analysis was performed using IBM SPSS (Statistical Package for Social Sciences) software package. Descriptive analysis was used to give frequencies, percentages and mean. The anthropometric data were analyzed by using Epi-Info computer software and results were used to describe the nutrition status of the individuals. Indicators for stunting (height-for-age), wasting (weight-for-height), underweight and (weight-for-age) were determined and used to assess nutrition status of the people. For adults, BMI was used to show their nutrition status. BMI below 18.5 Kg/m\(^2\) indicates thinness or acute under-nutrition and a BMI of 25.0 Kg/m\(^2\) or above indicates overweight, or obesity. A BMI that is below 16.0 Kg/m\(^2\) indicates severe under-nutrition.
3.7 Ethical Consideration

Research ethics cover a number of concerns including ensuring the welfare of those who participate in the research, maintaining integrity in conducting research and treating information given by participants with utmost secrecy and confidentiality.

In the process of adhering with ethical issues, the research permit and approval to conduct the study was sought and obtained from Sokoine University of Agriculture. Research permission was required and obtained from Kilosa District. Furthermore, informed permission was sought and obtained from participants before they participated in the study, particularly, participants were informed about the objectives of the study and that their participation would be unpaid as there were no any kinds of cohesion for participation. In addition, more participants were asked to be free to refuse or leave at any time in the course of the study without any effect. It was clearly clarified that the information provided whether orally or in writing would be for research purposes and therefore was strictly anonymous and dealt with confidentiality.

3.8 Limitations

During data collection some limitations were encountered which caused the research to take long time. The research was carried out during the raining season (see plate 4) so the researcher had to take more time than planned. Also long distance from one household to another was a challenge as some villagers had to go to the farm hence led to time limitation for data collection. Migration of the people from one place to another was a challenge hence it decreased sample size and last some respondents were busy with the farm work hence no time for taking anthropometric measurement.
Plate 4: Rainfall during data collection
CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Demographic Characteristics of Households

4.1.1 Distribution and sex of respondents in hamlet

A total of 158 heads of the households were interviewed in five Hamlets namely, Shuleni, Muungano, Kigenge, Makurunge and Mkoroshini. These were distributed proportional to the size of households in the various hamlets. Shuleni hamlet contributed the highest number of households (23.4%) and Kigenge the lowest number of households (16.5%). Other hamlets Mkoroshini, Makurunge and Muungano, each contributed about 20% of the households. The sample comprised 72.8% males and 27.2% females. From each hamlet, the proportion of male headed households was higher than that of female headed households (Fig. 4). This proportion is in line with (TNBS, 2012), Rudewa has average population of 4.3 and sex ration being 98.

![Figure 4: Sex of respondents.](image-url)
In this survey male respondents were more than female respondents, contrary to the general observation whereby female respondents are usually higher in proportion than males. This is because males were mobilized specifically to be present during the interviews to provide information related to household characteristics which could not be obtained from female respondents alone. Male head of households insisted that they should be interviewed and not their partners. It is evident that males could be willing to participate in research activities if well informed and mobilized for the task. Therefore there is a need to involve males in research activities for balanced views and implementation of activities. The small proportion of women respondents therefore depicts female headed households and males that were not present at home during the time of the interview due to other commitments such as travel and engagement in economic activities.

4.1.2 Age of respondents

Seventy three percent of the respondents (73%) were within the age groups of 20-40 and 41-60. The 61-80 age category had 25% of the respondents. The 81-100 age group had only 2% of the respondents; all originating from Shuleni and Muungano hamlets.
4.1.3 Marital status of the respondents

About 75% of the respondents were married, 5% were single, 9% were separated and 11 were widows.

Table 2: Marital status and sex composition of the respondent (n=158)

<table>
<thead>
<tr>
<th>Marital status</th>
<th>Single</th>
<th>Married</th>
<th>Separated</th>
<th>Widow</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>1.9</td>
<td>21</td>
<td>13.1</td>
<td>6</td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>3.8</td>
<td>98</td>
<td>62</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>5.7</td>
<td>119</td>
<td>75.3</td>
<td>15</td>
</tr>
</tbody>
</table>

Marital status is the legal union of a man and woman as husband and wife or is the condition of being married or unmarried. Most of the single parents (9%) are more vulnerable group in many communities since they have less access to resources. As a result they cannot afford to provide basic needs for the family such as food, shelter and
clothing. FGD revealed that single parents especially male can fail to prepare food at home and end up taking too much alcohol and less food hence experience poor nutritional status.

4.1.4 Education Level

About 50% of the respondents had attained primary education. Only 3.7% had a secondary education and 0.8% (1 respondent) had attained university education among the 158 respondents. About 46% had never attained primary school education, which is considered a basic education level in Tanzania. Education provides people with the knowledge and skills that can lead them to a better quality of life. The Tanzania Demographic and Health survey (TDHS, 2010) revealed that education is correlated with the health of the mothers and their children. Educated mothers are more likely to provide better care for their children compared to less educated mothers. This is because they are able to follow guidelines provided during antenatal and postnatal visits and they can read materials provided at the clinics. The low level of education of the people in the study area could be due to limited number of and accessibility to schools. In Rudewa Mbuyuni village there is only one primary school to cater for the whole population and it is located far away from some of the hamlets. Therefore due to long distance to the school some of the people from distant hamlets choose to drop out from school before completing their primary education.

Table 3: Education level by sex (%) (n=158)

<table>
<thead>
<tr>
<th>Education level</th>
<th>Male</th>
<th>Female</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No formal education</td>
<td>47</td>
<td>25</td>
<td>72</td>
<td>45.5</td>
</tr>
<tr>
<td>Primary</td>
<td>63</td>
<td>17</td>
<td>79</td>
<td>50</td>
</tr>
<tr>
<td>Secondary</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>3.7</td>
</tr>
<tr>
<td>University</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>115</td>
<td>43</td>
<td>158</td>
<td>100</td>
</tr>
</tbody>
</table>
Education is one of the key determinants of the lifestyle and status an individual enjoys in a society. The influence of education on health and nutrition has been observed by several researchers and education attainment has a strong effect on morbidity and issues related to hygiene and sanitation. (UNESCO, 2007; PRB, 2009).

However, in the present study the prevalence of under nutritional was observed in both educated and those with no education. This could be attributed to lack of nutrition education among respondents. Although they have education, they are not aware about nutrition. Most of them just eat in order to satisfy their hunger without considering nutritional needs.

4.1.5 Occupation and income

Only 13% of the respondents were employed in private or public sectors and on paid salaries. About 83% were self employed as petty trader, crop farmers, livestock keeper, labourers and carpenters and the rest 4% were dependants (Table 4).

Table 4: Occupation of Respondents (n=158)

<table>
<thead>
<tr>
<th>Occupation of the HH</th>
<th>Male</th>
<th>Female</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>96</td>
<td>36</td>
<td>132</td>
<td>83.5</td>
</tr>
<tr>
<td>Dependent</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>3.8</td>
</tr>
<tr>
<td>Employed (private or public)</td>
<td>13</td>
<td>7</td>
<td>20</td>
<td>12.7</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>43</td>
<td>158</td>
<td>100</td>
</tr>
</tbody>
</table>
4.2 Distribution of Housing Characteristic

The housing characteristics are presented on Plate 5. About 86% of the respondents owned a house; however the houses were of poor quality.

Plate 5: Houses with poor quality in Rudewa Village

Also, slightly higher than three quarters (78.5%) of the houses were having earth/soil floor, 64.5% of the houses had walls made up of mud bricks and 23% of them had used poles for construction of walls. Roofing materials ranged from grass (54.5%) and galvanized iron sheets (44.3%). Paraffin was the main (95%) source of light, firewood the main (96.2%) source of fuel and wells the main source of water. Despite reliable source of water, about 87.3% of households do nothing to ensure that water is safe for drinking. About 10% do not have toilets facilities. Moreover, about 21% of them do not use any washing agents to wash their hands after visiting the toilet and before eating.

The types of assets owned by the households were used to categorise households into different socioeconomic groups or income brackets. In this study three categories were
formed; ownership of at least a TV, a push cart, a motor cycle, a gas cooker and a house for renting was categorized as high income bracket. Ownership of at least a mobile phone, a bicycle, a fish net, a table, land and a house for living was categorized as medium income bracket. The low income bracket in this data set meant ownership of basic assets like beds, chairs, cupboard, hoes, mosquito nets and utensils. About 61% of the households were in the low income bracket. For instance 60.5% had chairs as the highest asset owned and 96% had beds. Only 35% represented the medium income group and only 1.7% represented the high income group (ranging from 1.7% who owned push carts to 3.9% who owned TV set).

Table 5: Household characteristics (n=158)

<table>
<thead>
<tr>
<th>Household characteristics</th>
<th>Variable name</th>
<th>n</th>
<th>Female</th>
<th>Male</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership of the house</td>
<td>Yes</td>
<td>136</td>
<td>38</td>
<td>48.1</td>
<td>86.1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td>9</td>
<td>4.9</td>
<td>13.9</td>
</tr>
<tr>
<td>Floor of the house</td>
<td>Cement</td>
<td>31</td>
<td>5</td>
<td>9.5</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Floor tiles</td>
<td>3</td>
<td>1.5</td>
<td>5.5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Earth/Soil</td>
<td>124</td>
<td>35</td>
<td>43.5</td>
<td>78.5</td>
</tr>
<tr>
<td>Wall of the house</td>
<td>Block/cement/concrete/stone</td>
<td>22</td>
<td>5</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Baked/burnt bricks</td>
<td>34</td>
<td>5</td>
<td>16.5</td>
<td>21.5</td>
</tr>
<tr>
<td></td>
<td>Mud bricks</td>
<td>102</td>
<td>29</td>
<td>35.5</td>
<td>64.5</td>
</tr>
<tr>
<td>Roof of the house</td>
<td>Galvanized iron sheet</td>
<td>70</td>
<td>18</td>
<td>26.3</td>
<td>44.3</td>
</tr>
<tr>
<td></td>
<td>Roofing tiles</td>
<td>2</td>
<td>0.3</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>Grass leaves</td>
<td>86</td>
<td>22</td>
<td>32.4</td>
<td>54.4</td>
</tr>
<tr>
<td>Main source of energy for cooking</td>
<td>Paraffin</td>
<td>2</td>
<td>1</td>
<td>0.3</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>Charcoal</td>
<td>4</td>
<td>1.5</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Firewood</td>
<td>152</td>
<td>60</td>
<td>36.2</td>
<td>96.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>158</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
The physical characteristics of households are important determinants of the wealth status of household members especially children, pregnant women and the elderly. They can also be used as indicators of the socioeconomic status of households (TDHS, 2010). In this study, respondents were asked to provide information on housing characteristics (ownership, floor, walls, roof, source of light and power). Asset possession is one of the ways to identify households of wealth status. Socio-economic factors that were assessed included source of energy, source of drinking water. Generally households with a large number of assets such as chairs, phone, beds, chairs, cupboard, mosquito nets, and radio are considered to be wealthier than others. Most of the houses had earth floor and of poor quality.

4.2.1 Information on source and reliability of water

Table 6 presents the results on sources of water and the reliability of water supply. The results indicate that majority of the households in Rudewa Mbuyuni have access to clean water sources. About 96% of the households had an access to a protected water source. Piped water and protected wells are known to be free from waterborne disease causing agents including those for diarrhoea and dysentery. Understanding of the source of drinking water is very important in the Tanzania setting because water borne diseases are highly prevalent and they vary from season to season. Sources of water such as unprotected wells, rivers or streams, ponds, lakes, or dams are more likely to carry disease-causing agents. The mean distance to a water source was 0.61 kilometre and the average time taken to and from the source of water was about 13 minutes.
Table 6: Information on source and reliability of water (n=158)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of portable water</td>
<td>Piped inside house/outside house</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>Protected well/spring</td>
<td>154</td>
<td>98.3</td>
</tr>
<tr>
<td></td>
<td>Unprotected well/spring/river/dam/lake</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Reliability of water source</td>
<td>Yes</td>
<td>158</td>
<td>100.0</td>
</tr>
<tr>
<td>Distance between latrine and</td>
<td>1-30</td>
<td>9</td>
<td>8.5</td>
</tr>
<tr>
<td>water source (meters)</td>
<td>&gt;30</td>
<td>149</td>
<td>91.5</td>
</tr>
<tr>
<td>Variable</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance from home to the</td>
<td></td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>source of water (km)</td>
<td>Range&lt;sup&gt;1&lt;/sup&gt;</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.61±0.88</td>
<td></td>
</tr>
<tr>
<td>Time taken to and from the</td>
<td></td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>source of water (min)</td>
<td>Range&lt;sup&gt;1&lt;/sup&gt;</td>
<td>60.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean&lt;sup&gt;2&lt;/sup&gt;</td>
<td>13.67±16.07</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>Distance from home and time taken to and from the source of water.

<sup>2</sup>Average distance from home and time taken to and from the source of water.

4.2.2 Information on the toilet usage

With regard to toilet usage, Table 7 shows that 90% of the households had a toilet facility, 10% had no facility and reported using nearby bushes as toilets. Lack of resources (80%) and lack of desire to construct a toilet (20%) were reported as main reasons for not having a toilet. The results further showed that 98% of the households were still using the traditional pit latrines and less than 2% were using flush toilet and modern ventilated improved pit latrines.
Table 7: Information on the availability of toilet facility and usage (n=158)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable name</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household have a toilet</td>
<td>Yes</td>
<td>152</td>
<td>96.2</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>6</td>
<td>3.8</td>
</tr>
<tr>
<td>Households without a toilet</td>
<td>Neighbor</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Bush</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Kind of the toilets the household</td>
<td>Flush toilet</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>Traditional pit latrines</td>
<td>150</td>
<td>97.1</td>
</tr>
<tr>
<td>Sharing of toilets with other</td>
<td>Yes</td>
<td>17</td>
<td>15.2</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>141</td>
<td>84.8</td>
</tr>
<tr>
<td>Reasons for not having a toilet</td>
<td>Lack of resources to</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Does not see the need</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Maintain basic hygiene practices</td>
<td>Yes</td>
<td>156</td>
<td>98.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Washing agents</td>
<td>Soap</td>
<td>136</td>
<td>77.0</td>
</tr>
<tr>
<td></td>
<td>Ash</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>21</td>
<td>21.9</td>
</tr>
</tbody>
</table>

4.2.3 Major sources of income for the household

Farming was an important occupation for 93% of the respondents. However, a small proportion of the respondents depended on wages (7%) and petty business as their main source of income. Of these, 80% did not produce enough food last year. Reasons for low production included unreliable rainfall, loss of labor, pest attack, climate change and lack of capital. The main sources of income are presented in Table 8.
Table 8: Major sources of income

<table>
<thead>
<tr>
<th>Variable type</th>
<th>Variable name</th>
<th>n</th>
<th>Female</th>
<th>Male</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produced enough food to last all year round</td>
<td>Yes</td>
<td>48</td>
<td>22</td>
<td>31</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>110</td>
<td>78</td>
<td>69</td>
<td>80.0</td>
</tr>
<tr>
<td>Reasons for low food production</td>
<td>Unreliable rainfall</td>
<td>48</td>
<td>25</td>
<td>37</td>
<td>32.4</td>
</tr>
<tr>
<td></td>
<td>Loss of labor</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>Pest attack</td>
<td>12</td>
<td>7</td>
<td>8</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td>Need for money</td>
<td>15</td>
<td>17</td>
<td>21</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>Weather change</td>
<td>40</td>
<td>25</td>
<td>12</td>
<td>26.8</td>
</tr>
<tr>
<td></td>
<td>Lack of capital</td>
<td>24</td>
<td>20</td>
<td>17</td>
<td>16.2</td>
</tr>
<tr>
<td>Use of chemical in agricultural fields and fishing</td>
<td>No</td>
<td>158</td>
<td>100</td>
<td>100</td>
<td>100.0</td>
</tr>
</tbody>
</table>

4.3 Household Food Availability

4.3.1 Source of food

From the study, (in both males and females) forty percent of the households produced their own food and 60% had to purchase food for consumption. Despite the fact that most of the households produce less than what is required by the households, still a big number of the households sell whatever little they produced. About 80% of the households reported to have sold crops they harvested in the last season. Need for money (95%) to meet other household needs was the main reported reason for selling their crops. Only 5% of the households reported surplus production was the reason for crop selling.
4.3.2 Food production

Crop production is practiced by 93% of the participants. Of these, 87% cultivate crops such as maize, rice, millet, sorghum, beans; other crops being cultivated with these crops were sweet potatoes, Irish potatoes, cowpeas, peanuts and cassava (1.3%) and 11.7% were cultivating both cereals and tuber (Table 9). Close to 57% of the households depended on their own production as main means for accessing food. Results further show a big proportion (42%) of the households depended on cash to access food.

This high dependency on cash to buy foods means these people will have to work more to generate income to be able to meet the food needs of their households (Table 9).

Table 9: Crops cultivated by respondents in the study area (n=158)

<table>
<thead>
<tr>
<th>Types of crops cultivated</th>
<th>n</th>
<th>Female</th>
<th>Male</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals such as: Maize, rice, millet, sorghum</td>
<td>138</td>
<td>50</td>
<td>37</td>
<td>87</td>
</tr>
<tr>
<td>Tubers and roots such as cassava sweet potatoes, Irish potatoes, cowpeas peanuts</td>
<td>2</td>
<td>1.1</td>
<td>0.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Both cereals and tubers</td>
<td>18</td>
<td>5</td>
<td>6.7</td>
<td>11.7</td>
</tr>
<tr>
<td>Own production</td>
<td>98</td>
<td>20</td>
<td>37</td>
<td>57</td>
</tr>
<tr>
<td>Aid</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Purchase</td>
<td>51</td>
<td>12</td>
<td>26</td>
<td>38</td>
</tr>
</tbody>
</table>

These findings are in line with KDC, (2010) whereby they presented that more than 80% of people in Kilosa depend on agriculture and with its varied conditions, ranging from a plateau characterised by seasonally flooded plains, to mountainous areas with altitudes surpassing 2000m, Kilosa District offers a variety of agro-ecological conditions for farming.
A variety of crops which were mentioned in the District include maize, rice, millet, cassava, beans, bananas and cowpeas. Besides food crops, the main cash crops are sisal, cotton, coffee, wheat, cashew nuts, coconuts, sugar cane and tobacco. Some of the food crops are also used as cash crops. Small-scale farming where on average farmland is less than one hectare and represents 90% of agriculture. The small-scale farm holders are subsistence farmers who produce mostly for domestic use, selling only their surplus. There is an adequate use of inputs such as improved seeds, fertilizers and/or manure, and the majority (95%) use hand hoes for cultivation (Yanda et al., 1997; KDC, 2010).

4.3.3 Livestock keeping
Animal husbandry is an essential component of livelihoods for the households in Rudewa village. Livestock provide milk, meat and eggs for household consumption and contributes to food security and dietary diversity. In case of food shortage households may resort to selling the livestock to absorb the shock by using the money to buy cereals.

However, the diversity of types of animals per household is relatively low; only four types of livestock are kept with most (91%) of the households keeping chicken/ducks. The mean number of chicken/ducks kept by the households was 15. The rest of the types of livestock are represented by less than 5% and this includes goat, sheep, cattle and pigs.

4.3.4 Intra-household food distribution
Intra-household food distribution is how the food is shared in each household. Findings indicate that, about 55% of the households eat food from common plates. However, 30% of the households served the food to children on separate plates and for other households, 15% of the fathers are served first before any other members of the household.
4.3.5 Food consumption

Respondents were asked to mention the foods they had eaten in the period of 24 hours prior to the survey day. Findings show that most of the household do not consume a balanced diet. Households would just make sure they have something to eat and it does not matter whether the meal composes of a variety of foods. However, during FGD (women alone) reported that low economic situation in the village does not allow them to prepare good foods because it requires money for buying them.

Cereal consumption was significantly common compared to other types of food groups. Stiff porridge, rice, beef, beans, sardines, chicken, fish, amaranth, tomatoes and plantains were consumed most frequently in a week, and the least consumed foods were eggs, milk and cassava. Fruits and vegetables are consumed occasionally and depended on the season. Some of the consumed foods are listed in Table 10

Table 10: Food consumption

<table>
<thead>
<tr>
<th>Period</th>
<th>Food Variety Eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Tea, sugar, ugali, oil/fat, buns, onion, rice, vegetables.</td>
</tr>
<tr>
<td>Weekly</td>
<td>Milk, tomatoes, soda, beef, fish, rice, makande, cassava, bread, beans, coconutmilk, margarine, bananas, mangoes, papaya, ammaranthus &amp; alcohols</td>
</tr>
<tr>
<td>Monthly</td>
<td>Chicken, pork, beer, sardines/fish and meat</td>
</tr>
</tbody>
</table>

4.3.6 Individual dietary diversity score (IDDS) categories

Figure 6 indicates categorisation of the dietary diversity scores. Although dietary diversity is considered as a key element of diversified diet, almost 48% of the villagers
consume low diversified diets (< 3) and only 16% of the respondents consume high diversified diets (≥ 6).

![Individual dietary diversity score (IDDS) categories.](image)

**Figure 6: Individual dietary diversity score (IDDS) categories.**

### 4.3.7 Food shortage

Eighty two percent of the surveyed households experienced food shortage in the 2012/13 farming season. About 40% of the respondents agreed that there was food shortage in Kilosa District. The main reasons for food shortage reported during focus group discussions were unpredictable rains due to climate change (Table 12). Food shortage may lead to migration of the household members who mostly are men to other areas. When men migrate, women are left at home to take care of the children and shoulder all other responsibilities including farming and other activities. In some cases both young children and women participate in paid jobs such as working as casual labourers in the fields in order to get food or cash to buy food.
Furthermore, 28% of the respondents claimed that they had a big family and many dependants and the government does not support them when there is crop failure due to unpredictable rainfall. Therefore shortage of food leads to poor nutrition status (Table 10).

4.3.8 Coping strategies during food shortage

Coping strategies are important measures that enable people to absorb the impact of shock (for any emergency). Communities have different levels of coping mechanisms that allow them either respond to hazards or prevent potential hazards. Communities with greater adaptive capacity face lower risk of disaster. From the research, it was found that people in Rudewa Mbuyuni village, have a wide range of coping strategies that help them to cope with food shortage. Coping mechanisms differ depending on individual perspective and location. From the interviewed respondents and from FGD, coping strategies included; reducing of meal frequency, planting crops at water sources (Change crop pattern/adopting new crops), and migration of household head.

4.3.8.1 Reducing of Meal frequency

About 79% of the respondents indicated that they reduce number of meals during food shortage. It was revealed that households tend to reduce food consumption, indicated by declining number of meals per day, with severe consequences for the household’s nutritional and health status during food shortages and high food prices. This is probably a problem faced by many Tanzanian families in their everyday lives.

4.3.8.2 Planting crops at water sources - Change crop pattern/adopting new crops

Over 87% of the respondents reported that they plant crops at water sources during times of excessive drought. This has been practised by many people in Rudewa in order to meet
their food needs. Moreover, 18% reported that they have abandoned rice production as a result of serious drought in the study area. In addition, farmers have adopted new crops in response to the impact of climate variability and change so that they can get food for consumption. Some of the dominant crops adopted include maize (for those who have been growing rice), sunflower, sorghum and beans. The adopted crops were not picked arbitrarily but based on a number of reasons including environmental stress.

![Graph of Adopted Crops](image)

**Figure 7: Adopted crops.**

**4.3.8.3 Migration of household head**

The impact of climate change has led to migration of the household head from rural to urban areas. Climate change eventually force people to abandon where they live (especially men) in order to seek new homes and livelihoods. Forced displacement is associated with a range of health issues, including social isolation, mental disorders, and
in many cases, reduced socio-economic status associated health problems. Population displacement associated with natural hazards compromises health and damages lives. When household head (men) migrate, a woman is left at home to take care of the children. However, few who migrate remember to send remittances home but some even abandon their families completely so the burden and responsibility is left on women.

Plate 6: Migration of people from HH to displaced area in Magole.

4.4 Energy Sources for Cooking

People in Rudewa Village use three types of energy for cooking. The findings show that 96.2% of the respondents use firewood, 2.5% use charcoal and 1.3% use paraffin for cooking.
From FGD (women alone) highlighted that they uses firewood for cooking, 33.1% buy firewood and the remaining 66.9% collect directly from the forest. For those who buy firewood, they spend between 500 and 1000TZS per day.

4.5 Gender

In most cases women in Tanzania do not have the same opportunities as men. This is because there is gender inequity for education and economic independence. Focus group participants affirmed that, boys education tend to be valued more than that of girls. This is because girls have to assist their mothers in domestic responsibilities and end up getting married. Girls in some of the families are regarded as workers because it is a belief among many parents that even if girls are educated they will be married and stay at home to raise a family and their knowledge will not be of value.

Some males who participated in the discussion said that although there is inequality between males and females (proportion of 69 males to 31 females), power balance is changing because in some families women and men make decisions together.

"A woman can go to work and after coming back do all the domestic activities even if she is tired. Activities include washing for her husband and children; prepare food for the whole family. Girls are used to help their mothers in domestic activities while boys are moving around with bicycles" 'Mariam Juma

Therefore it was observed that, women have a primary role of doing domestic works in the household compared to men and have little influence in decision making. Men make decisions in the family and such decisions include decision about finances, property, and childrearing. Girls and women often seek permission from their household head (father) to leave home and perform other responsibilities out of domestic activities.
4.5.1 Activity pattern in relation to gender

The main reason for this was to capture necessary information on the activity pattern of women and men, girls and boys so as to know who does what. Child care was reported to be a sole responsibility of women and they are not supposed to leave children at home except during emergency. Men normally spend most of their time outside home and they normally come back late. Majority (81%) said that children will normally prefer asking their mothers for whatever they need. Serving of food was reported to consider sex and age. Plate 6 illustrates role of women at home. One abandons woman had baby twins and had to feed them and at the same time she had to deal with other activities at home such as cooking, washing, looking for water.

Plate 7: Activity Pattern in Relation to Gender
4.6 Climate Change

Climate change is real and villagers are experiencing the impact of it. About 97% of the respondents perceived that climatic conditions have been changing in their village and cited changed rainfall pattern as the major (64%) component of the climate change. About 57% of the respondents indicated that deforestation was the main cause of climate change. Other causes included overstocking and overgrazing (11.8%) and cultivation along the catchment areas. Effects of climate change observed by Rudewa village residents included long dry spells, short rain seasons and reduced rainfall.

4.6.1 People’s attitude towards climate change

Climate change was perceived as a disaster that needs to be mitigated. The community sees it that little has been done by the authorities to enforce the existing laws to preventing the impacts of climate change due to human activities. Communities need to be more involved at each stage to make the strategies intended at preventing the impacts of climate change.

4.6.2 People’s perception on climate variability

Information from the field survey revealed that 89% of the respondents are aware of rainfall and temperature as important entities of climate change. Furthermore, 91% reported that wind speed has also being changing. Rudewa Mbuyuni residents have been experiencing increased wind speed. Therefore, 82% of the respondents reported that temperature is increasing and 16% reported that temperature is decreasing and 2% did not know.
Table 11: Perception of people on climate variability n=158

<table>
<thead>
<tr>
<th>People’s perception on climate variability</th>
<th>n</th>
<th>Female</th>
<th>Male</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of high speed of wind</td>
<td>142</td>
<td>40</td>
<td>49.9</td>
<td>89.9</td>
</tr>
<tr>
<td>Temperature is increasing</td>
<td>14</td>
<td>2</td>
<td>6.8</td>
<td>8.8</td>
</tr>
<tr>
<td>I don’t know</td>
<td>2</td>
<td>0</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td>42</td>
<td>58</td>
<td>100</td>
</tr>
</tbody>
</table>

4.6.2 Community perception on impact of climate change

Eighty eight percent of the respondents were aware of the term climate change and they linked it with rainfall and temperature. Furthermore, 92.7% of the respondents reported that temperature has increased due to climate change. This implies that majority of the people in the study area are aware of the impact of climate change. Other aspects mentioned that were related to CC include and decreased rainfall change and decreased crop production. Climate Change associated with pattern human activities and natural factor such as change of seasons, immigration and socio economic activities as result shift to crop season. The study findings were comparable with those by IPCC (2007), which found that human social - economic activities and climate change affect nutrition status.

4.6.3 Impacts of climate vulnerability

About 74% of the subjects indicated that climate change has a great impact on crop damage as it contributes to changing rainfall regimes and livestock loss (17.7%). Climate change can be a problem to people’s health because of food shortage as people cannot improve their health if they can not harvest enough food to meet their nutrition needs.
Table 12: Climate Change and its impacts (n=158)

<table>
<thead>
<tr>
<th>Impacts of Climate CC</th>
<th>Female</th>
<th>Male</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop damage</td>
<td>117</td>
<td>30</td>
<td>44</td>
</tr>
<tr>
<td>Livestock loss</td>
<td>28</td>
<td>7.7</td>
<td>10</td>
</tr>
<tr>
<td>Loss of household assets</td>
<td>3</td>
<td>0.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Infrastructure damage</td>
<td>1</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td>Loss of life</td>
<td>2</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Loss of natural resources</td>
<td>7</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td>41.5</td>
<td>58.5</td>
</tr>
</tbody>
</table>

4.7 Nutrition Status

4.7.1 Nutrition status for adults

Nutritional assessment covered individual food consumption, hygiene, sanitation and Anthropometric measurements. Anthropometric results of the nutritional status of the adults in the village are presented in Figure 8. The prevalence of underweight and overweight was 7.5% and 15%, respectively. Some of the adults were obese (7%). However, from these results men were observed to be more underweight than women, on the other hand more women were overweight and obese than men. This shows that as much as there is a burden of under nutrition in the village, there is also over nutrition.
Current, 11% of women in Tanzania are undernourished (falling below the cut off-point) while 22% weigh more than they should (15% overweight and 6% obese). Adult, (women and men) of age over 18 years whose anthropometric measurement were taken for weight and height 68% of them have normal BMI while 24% are overweight (TDHS, 2010).

In the FGD by both males and women, several reasons were forwarded as to why more men were underweight than women. It was observed that the burden of work and stress men experienced to fend for family needs was overwhelming leading to body wasting. It was also observed long hours that men outside home often lead to low food intake and sometimes the year fewer number of meals compared to women that women naturally had more body reserves to withstand hunger. It was also suggested that since women are
of food. Too much consumption of alcohol by men led to poor food intake especially vegetable and fruits resulting into body waste.

4.7.2 Nutrition status of children

A total of 124 children were assessed, of which 52 were boys and 72 girls. Findings show that 15% of the boys and 8% of the girls were overweight (Fig. 9). In addition, 12% of the boys and 8% of the girls were underweight. This means there was a little difference in nutrition status between boys and girls. Girls were more nourished than boys. The difference between their nutritional status is not that huge, it was only for 5 – 10%. This is in relation to TDHS (2010), in which 42 % of children under 5 years of age have low height-for-age, 5 %t have low weight-for-height, and 16 % have low weight-for-age, which reflects both nutritional status of children.

![Nutritional status of children in Rudewa Village](image)

**Figure 9: Nutritional status for children.**

Anthronometric measurement is a most useful tool for assessing the nutritional status of
below 5 years of age. About 32% of children in the developing countries are undernourished (UNICEF, 2004a). Children with the age 10-24 months are highly affected because they are in the active growth age. In Rudewa Mbuyuni village, most mothers breastfeed the child until when the child is 24 months. After that, the child is well grown and can take care of her/himself. At the age of two years it is a period of rapid growth and the child needs quality and quantity foods. Malaria cases were also found to be a problem in Rudewa so malaria can highly contribute to low dietary intake hence poor nutrition.

4.7.3 Nutritional status based on MUAC for all children

The findings show that according to MUAC the risk of malnutrition was low (5.6%) with females having slightly higher risk compared to males.

Table 13: Nutritional status for children (n=158)

<table>
<thead>
<tr>
<th>Normal nutritional status</th>
<th>n</th>
<th>Female</th>
<th>Male</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal nutritional status</td>
<td>80</td>
<td>45</td>
<td>49</td>
<td>94</td>
</tr>
<tr>
<td>Moderate risk of malnutrition</td>
<td>8</td>
<td>2</td>
<td>2.7</td>
<td>4.7</td>
</tr>
<tr>
<td>High risk of malnutrition</td>
<td>10</td>
<td>1</td>
<td>0.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Total</td>
<td>124</td>
<td>48</td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>

4.7.3 Reasons for poor nutrition status among boys than girls

Boys play a lot and miss out during meal time. Sometimes there is poor care by adults, very few people bother whether a child has eaten or not, and this was most pertinent in big families where everyone has to struggle for his/her survival. Also, there is poor meal
planning, in this case the time for children to eat is not given priority. Some of the children are tired and cannot wait for the food to be ready hence they go to bed before eating. Children are abandoned by their parents; a considerable number of children are living with their grandparents. In addition secondary data (collected data over years in the community health worker) showed that there was an increasing trend of under-nutrition in Kilosa for the past ten years.

Table 14: Nutritional status by age of a child based on MUAC (n=158)

<table>
<thead>
<tr>
<th>Nutritional status</th>
<th>Age categories (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal nutrition status</td>
<td>12</td>
</tr>
<tr>
<td>Moderate malnutrition</td>
<td>0</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>

4.8 Impact of Climate Change on Nutrition Status

During FGD it was argued that of climate change can lead to less rainfall which affects nutritional status of the households. Climate change can also affect human socio-economic activities particularly agricultural. In addition, other activities including cutting down trees for charcoal, poles for building and firewood, lend to further environmental degradation. During FGD with women in Mkoroshini ward it was revealed that there is perception and belief that unreliable rain was due to God will. The Food and Agriculture
Organization of the United Nations (FAO) estimates that more than one billion people were undernourished worldwide in 2009; this is about 100 million people more than in 2008, around one-sixth of all humanity.

4.8.1 Effects of Climate Change on Gender Relation

Climate change has an effect on gender relations at household and community levels, and women and men are affected differently when it comes to the issue of wage labour, ownership and decision making in the family and community level. Women and girls particularly suffer more negatively compared to males because they have higher mortality than men in natural disaster due to their impoverishment. Both women and men depend more on natural resources but women and girls are more affected because they are the ones who are responsible for preparing food at home. During the 19th century women travelled further away from their home to collect firewood and other primary household needs like vegetables and fruits. This was different to men and boys because they all are not involved in processes of food preparation.

During the FGD, women observed that they are the main providers of food and meals for their families. They bear a greater burden to fulfill this task when climate change events occur. It was observed that men lose their income from remunerated work on farms while women lose fruits, vegetables, chickens, and ducks from their home yards. These losses seriously affected women’s ability to feed their families since they previously obtained a significant portion of their daily food from their own yards hence nutrition status become poor. Labour may include land ownership which is already unequal in most of developing countries. A gendered in earnings persists across almost all employment category.
4.8.2 Linkages between Climate Change and Nutrition Status

From the survey, it was observed that there is a linkage between climate change and nutrition status. About 80% of the respondents indicated that climate change has been a problem to nutritional status because they have reduced amount of food eaten and the number of meals per day due to low food production. Climate Change can lead to reduced yield and food, also reduced income. Poor production can lead to some possible nutritional problems which are caused by Climate Change in their community. One of the problems can be diseases such as diarrhea and upper respiratory track infection. In addition to the impact of climate change and variability, some respondents reported that one of the factors affecting their production is the existence of pests and disease. During focus group discussion, when they were asked, if there is a linkage between Climate Change and nutrition status, they said there is a big linkage because if you do not eat you cannot be food nutritionally secure.

Recently, Mselle et al. (2013) documented similar evidence of climate-change related weather pattern and their effects on food production and nutrition status of women and children in the same location. In their work they assessed long term weather patterns, morbidity, sanitation, and household food security and observed that there were increasing rainfall fluctuations over time, more of the fluctuations occurring in recent years and women from food secure households had significantly higher body mass index (BMI) than their counterparts in food insecure households while households with low hygiene and sanitation had significantly higher sanitary related diseases occurrence.

4.8.3 Rise of temperature

Temperature has increased gradually over the past 30 year period (between 1980 and 2012) in Rudewa Village. The increase of temperature has many impacts to nutrition
because of changing of rainfall as well as rise of sea level. Literature shows that climate change has been changing IPCC (2007). From 1980s, climate behavior has not been stable. This is because of changing rainfall patterns (January to April) which has both positive and negative impact.

4.8.4 Rainfall Variability and Associated Nutritional Risks in Rudewa Mbuyuni

Most of the respondents (93%) reported that temperature has increased and the rainfall has decreased compared to last 30 years. The data from meteorological department at ILONGA and SUA showed a similar trend. The trends in minimum and maximum average temperature and rainfall patterns over 30 years are presented in Fig. 11. The figures show that rainfall has decreased over the past 30 years, while the average (maximum and minimum) temperature has increased.

Therefore, rainfall variability is a problem in Rudewa. High rainfall and long rainfall can affect production in one way or another. From the climatic factor, key point to be used in the climate change component is changing of rainfall. Rainfall change has a big impact on nutrition status as low production lead people to purchase food. This is due to the fact that it affects changing of crop production hence people do not cultivate their crops on time hence poor nutrition status. Figure 10 shows how climate has been changing over years in Rudewa Mbuyuni, Kilosa District.
Findings from the survey and also from FGD show that between 1980 and 2012 the villagers have experienced fluctuation and variability in the rainfall pattern. This has lead to water scarcity and less food production as pointed out by 28.5% of the respondents. But also, they have experienced a rise in environmental temperature.

Also 33 (21%) respondents observed that rainfall patterns nowadays are different from the past years because rainfall is unpredictable. Formally there were two rain seasons: short rains occurred between October and January and long rains occurred from March to July. Currently rainfall is unpredictable. Moreover, 17 (10.8%) respondents observed that there are less trees than ten years back. Low harvests was perceived by (10.1%) and (5%) observed that agricultural yield per acre has gone down. In addition 5 (3.1%) of the respondents argued that Climate change can lead to eruption of both animal and crop
Table 15: Climate variation and change weather perceptions as assessed through HH interviews (n=158)

<table>
<thead>
<tr>
<th>CC and variation perceptions as assessed</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low harvests in farm fields</td>
<td>16</td>
<td>10.1</td>
</tr>
<tr>
<td>Water scarcity that limits production</td>
<td>45</td>
<td>28.5</td>
</tr>
<tr>
<td>Eruption of both animal and crop diseases</td>
<td>5</td>
<td>3.1</td>
</tr>
<tr>
<td>Think agricultural yield per acre has gone down</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Think there are less trees than ten years back</td>
<td>17</td>
<td>10.8</td>
</tr>
<tr>
<td>Think rainfall patterns now days are different from past years</td>
<td>33</td>
<td>21</td>
</tr>
<tr>
<td>Think dry spells are longer nowadays than in the past</td>
<td>34</td>
<td>21.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td>100</td>
</tr>
</tbody>
</table>
CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The following conclusions were drawn from the study:

(i) Most households in Rudewa-Mbuyuni do not meet their daily nutritional requirements resulting from food shortages due to impacts of decreased rainfall and increase of temperature linked to climate change thus negatively affecting nutrition status. Therefore, the government awareness about climate change impacts so that they can find a better measures of the climate impacts

(ii) Knowledge of climate change in Rudewa-Mbuyuni was high with an awareness of climate adaptation and mitigation strategies but people do ignore. People should be insisted on the adapting measures.

(iii) People in Rudewa-Mbuyuni village have less preference for indigenous foods (For example vegetables and fruits) especial on males. This attributable to lack of knowledge of the nutritional benefits of these foods. Nutrition education should be given to the people so that they can improve their nutrition status for both male, female, boys, girls and elders.

(iv) The social economic status of women in Rudewa-Mbuyuni is low than males and they have a high dependence on natural resources to support their livelihoods. Therefore, both male and female should be given equal in adapting measures and so that they can improve their nutrition status.
5.2 Recommendations

The following recommendations are forwarded:

(i) Community awareness and education on the significance of good nutritional status is necessary to ensure a balanced intake of nutritious foods for good health.

(ii) There is need to create awareness about climate change impacts and possible mitigation measures for people to adopt relevant climate adaptation measures and coping mechanism in order to reduce vulnerability of their livelihoods for improved nutrition status.

(iii) Climate scientists with other researchers and nutrition security stakeholders should work in collaboration together to support setting up/ strengthening nutrition early warning and surveillance systems.

(iv) Meteorological stations should inform the village community about the impacts of climate change on their livelihoods.
REFERENCES


Management approach on Forest Resources and Household Livelihood. Submitted to Tanzania Forestry Research Institute (TAFORI), Morogoro, Tanzania.


Otzelberger, A (2011). Gender-responsive strategies on climate change: recent progress and ways Forward for donors Author: Gender equality is an important pre-condition for successful climate change adaptation, and transition to low-carbon alternatives in developing countries. In order for this transition to be effective, climate change Relevance: 93% Type: Report; Policy/Planning; Bridge Report.


SOURCE: WB; UNISDR; GFDRR.


Appendix 1: Questionnaire to Evaluate Influence of Climate variability, gender relations and Nutritional status of children and adults

SECTION A

RESIDENCY AND SOCIO - DEMOGRAPHIC INFORMATION

1. District:  

2. Village  

3. Hamlet:  

4. Interview Date:  

5. Name of interviewer  

6. Household  

7. Name of respondent  

8. Age  

 1. Male  

 2. Female  

9. Sex  

10. Marital status  

   1. Marriage  

   2. Single  

   3. Widow/widower  

   4. Divorced/separated  

11. Level of education  

   1. No schooling  

   2. Primary education  

   3. Secondary education  

   4. College/ university  

   5. Others specify  

---
8. Occupation

1. Farmer
2. Employed in private or public sector
3. Unemployed
4. Business
5. Others (specify)......

SECTION B: SOCIO-ECONOMIC INFORMATION

9. Attributes of the house in which the household members live

<table>
<thead>
<tr>
<th>House</th>
<th>Attributes of the house</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Whether the household owns the house in which its members live</td>
<td>1 = Yes, 2 = No</td>
</tr>
<tr>
<td>a) Floor of the house</td>
<td>1 = Cement, 2 = Floor tiles, 3 = Earth/Soil, 4 = Others</td>
</tr>
<tr>
<td>a) Walls of the house</td>
<td>1 = Block/cement/concrete/stones, 2 = Baked/burnt bricks, 3 = Mud bricks, 4 = Mud and poles, 5 = Others (Specify)</td>
</tr>
<tr>
<td>a) Roof of the house</td>
<td>1 = Galvanized iron sheets, 2 = Asbestos sheets, 3 = Roofing tiles, 4 = Grass, leaves, bamboo, 5 = Others</td>
</tr>
<tr>
<td>a) Main source of light used in the house</td>
<td>1 = Grid electricity, 2 = Solar electricity, 3 = Gas, 4 = Paraffin, 5 = Candles, 6 = wood fire, 7 = Others (Specify)</td>
</tr>
<tr>
<td>a) Main source of power for cooking in the house</td>
<td>1 = Grid electricity, 2 = Solar electricity, 3 = Industrial gas, 4 = Biogas, 5 = Paraffin, 6 = Charcoal, 7 = Others (Specify)</td>
</tr>
<tr>
<td>a) Water treatment to make it safe for drinking</td>
<td>1 = Boil, 2 = Let it stand and settle/sedimentation, 3 = Add water guard or chlorine, 4 = Use water filter, 5 = Solar disinfection, 6 = Drink bottled water,</td>
</tr>
</tbody>
</table>
### a) Does your household have a toilet?

- Yes
- No

### a) If no, what do you use?

- Public
- Neighbor
- Bush

### a) Kind of toilet the household has/uses

- Flush toilet
- Traditional pit latrine
- Ventilated improved pit (VIT)
- Others (specify)

### a) Whether the toilet is shared with another household

- Yes
- No

### a) If no access to toilets, what is the main reason

- Pastoral/frequent movement
- Lack of resources to construct
- Does not see the need

### a) Distance between latrine and water source

- 1-30 m
- > 30 m
- NA (if using bush)

### a) Maintain basic hygienic hand washing practices (e.g., before eating, feeding the baby, cooking; after eating, cleaning the baby’s bottom; etc)?

- Yes
- No

### a) What washing agents do you use in your household?

- Soap
- Shampoo
- Ash
- Plant extracts
- None

### 10. What are your major sources of income and approximate monthly earning from them?

<table>
<thead>
<tr>
<th>Source of income</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Salary</td>
<td></td>
</tr>
<tr>
<td>2. Wages</td>
<td></td>
</tr>
<tr>
<td>3. Farming (including livestock)</td>
<td></td>
</tr>
<tr>
<td>4. Petty business</td>
<td></td>
</tr>
<tr>
<td>5. Transfers/assistance from relatives (gifts, remittances, etc)</td>
<td></td>
</tr>
<tr>
<td>6. Loans</td>
<td></td>
</tr>
<tr>
<td>7. Rents (house, equipment, tools)</td>
<td></td>
</tr>
<tr>
<td>8. Pension</td>
<td></td>
</tr>
<tr>
<td>9. Fishing</td>
<td></td>
</tr>
<tr>
<td>10. Others (Specify)</td>
<td></td>
</tr>
</tbody>
</table>
6. Which petty businesses do you do to get income for the household?

1. Brick making  
2. Food vending
3. Sell labour  
4. Selling charcoal  
5. Selling local brew  
6. Others mention?

SECTION C: HOUSEHOLD AND PRODUCTIVE ASSETS

Types of assets owned by the household

<table>
<thead>
<tr>
<th>Item</th>
<th>Ownership (1. Yes, 2. No)</th>
<th>Quantity in number</th>
<th>Owner (1=Husband, 2=Wife, 3=Both, 4=Children, 5=All)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bicycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Chairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cup board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fishing nets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Functioning mosquito nets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Functioning radio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Functioning telephone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Gas cooker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Hoe (s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>House (s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>House for renting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Land (acre)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Motor cycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Push cart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Table</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>TV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Others (Specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION D: HOUSEHOLD FOOD SECURITY

1. What is the main source of food for your household?
   1. Own production
   2. Purchase
   3. Aid.

2. How many acres do you cultivate? ................... (acres)

3. Who own land?
   1. Father
   2. Mother
   3. Both

4. Do men and women have equal opportunity to own or inherit land?
   1. Yes
   2. No

5. Does your household produce enough food to last all year round?
   1=Yes  2=No

5. If no, what would be the reason for not having enough food in the area?

6. Who makes decisions on what meals to have in your household?
   1. Husband
   2. Wife
   3. Older girls
   4. Older boys
7. Who looks for water
   1. Male looks for water
   2. Female looks for water
   3. Both

8. Ways in which food is served
   1. Male alone
   2. Female alone
   3. Both

9. What problems do you face when accessing food resources?
   1. Lack of finances to purchase them
   2. Scarcity
   3. Closed seasons/Restrictions
   4. Security
   5. Long distances to get them

10. Do you use chemicals in your agricultural field or when fishing?
    1. Yes 2. No

11. If yes, what chemicals do you use?
    1. Fish poison, 2. fertilizer, 3. pesticides, 4. herbicides

12. Which means of transport do you use to bring your produce home:
    6. Motorcar 7. Family vehicle

13. Was this means of transport
    1). owned 2). Hired?

14. If hired, how much did you pay?
15. Did you sell some of the crops you harvested last season?
   1. Yes  2. No

16. If yes who make decision on which crop to sell?

17. When did you sell your crops after harvest/livestock? ______ (months)

18. Which ways did you use to store your crops? (multiple response allowed)
   1. Jute bags  2. Drums  3. Traditional cribs

19. Which ways did you use to preserve your crops:
   1. Traditional  2. Modern

20. Why did you use these means? (multiple response allowed)
   1. Traditional ways
   2. To curb infestations
   3. Curb theft
   4. Other

SECTION E. ASSISTANCE, FOOD AID AND COPING STRATEGIES

1. Did you receive any assistance/food aid during the last 12 months?
   1. Yes  2. No

2. If yes, please mention the source
   4. NGOs/CBOs  5. Others (mention them)

3. How does your household cope with food insecurity situations?
4. Which measures does your household take to fight food shortage?

1. Consume less preferred foods  
2. Reduce number of meals  
3. Sell livestock  
4. Sell assets  
5. Remittances  
6. Temporary household migration  
7. Others mention  
12. Depend on food aid  
13. Others mention

5. Identify adoption measures/factors for adaption

1) Shifting
2) Reduce number of crops
3) Reduce number of cattle’s
4) Others (specify)

SECTION F: DIETARY INTAKE

Individual Dietary Diversity score (IDDS)

I would like to ask you about the foods and drinks you ate or drank yesterday during the day and at night, whether at home or outside of home. Please recall all foods and beverages you consumed beginning with yesterday morning when you woke up. These questions apply only to you and not to any other household members.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Food group</th>
<th>Examples</th>
<th>Yes (1)</th>
<th>No (0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cereals</td>
<td>bread, noodles, biscuits, cookies or any other foods made from millet, sorghum, maize, rice, wheat + insert local foods e.g. ugali, porridge or pastes or other locally available grains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Vitamin A Rich Vegetables And Tubers</td>
<td>pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside + other locally available vitamin-A rich vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tubers Roots And Banana</td>
<td>white potatoes, white yams, cassava, or foods made from roots, Taro, yams, sweet potatoes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dark Green Leafy Vegetables</td>
<td>dark green/leafy vegetables, including wild ones + locally available vitamin-A rich leaves such as cassava leaves, pumpkin leaves, sukuma leaves, amaranth leaves, spinach, taro leaves, Okra, mlenda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Other Vegetables</td>
<td>other vegetables, including wild vegetables like cucumber, French beans, sweet pepper (koko), egg plant, onion, tomatoes, cabbage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Vitamin A Rich Fruits</td>
<td>ripe mangoes, papayas + other locally available vitamin A-rich fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Other Fruits</td>
<td>other fruits, including wild fruits, orange, guava, sweet fruit, avocado, passion fruit, banana, pine-apple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Organ Meat (Iron-Rich)</td>
<td>liver, kidney, heart or other organ meats or blood-based foods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Flesh Meats</td>
<td>beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Eggs</td>
<td>egg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Fish</td>
<td>fresh or dried fish or sardines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Legumes, Nuts And Seeds</td>
<td>beans, peas, cowpeas, pigeon peas, green gram, lentils, nuts, seeds or foods made from these</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Milk and Milk Products</td>
<td>milk, cheese, yogurt or other milk products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Oils and Fats</td>
<td>oil, fats or butter added to food or used for cooking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sweets</td>
<td>sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Coffee/Tea</td>
<td>tea (black, green, herbal) or coffee, Soya</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SCORE**

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**A.** Was yesterday a special or feast day where you ate unusual foods?

**B.** Did you eat anything (meal or snack) outside of the home yesterday?

**IF YES:** check whether food is already included in the listing and if not, ask details

**C.** How many days over the past 7 days did you eat something (a meal or a snack) outside the home?
SECTION G: CLIMATE CHANGE

1. What is climate change?

2. Where did you get your knowledge on Climate Change
   1. media
   2. Newspaper
   3. Others

3. Do you think climatic conditions in this village have been changing?
   1. Yes
   2. No

4. If yes how? 1. Rains do not come like previous 2. Long dry spells
   3. Water is being fetched far 4. Others mention

5. What do you think are the causes of climate change?
   1. Deforestation
   2. Too much animals
   3. Emission of greenhouse gases
   4. People have been cultivating even in catchment areas
   5. Anthropogenic activities
   6. People no longer worship the god
   7. I don’t know

6. What challenges and constraints did you face in trying to adapt to climate change?
   1. Poor government support
   2. Poor leaders

7. Do you think CC affect nutrition status of this community?
   1. Yes
   2. No
8. What are the possible nutritional problems which are caused by CC in your community?
   1. Diseases  
   2. Diarrhea  
   3. Upper respiratory track infection  
   4. Others

9. What solutions have you put in place to alleviate these problems?

11. Does CC impact affect your eating behavior?
   1. Yes, how  

12. Who are most affected between women and men?
   1. Men  
   2. Women  
   3. Girls  
   4. Boys  
   5. Elders

13. How has the CC prolonged affected your livelihoods?
   a. Negative  
      1. Reduced yield and food  
      2. Reduced income
   b. Positive  
      1. More income from providing farm labor  
      2. Fewer incidences of human diseases  
      3. Plant vigor once it rains  
      4. Other (specify)

14. Is rainfall changing? 1 = yes, 2 = No
15. What common damages/losses do people in this area usually experience due to floods?

1. Crop damage  
2. Livestock loss  
3. Loss of household assets,  
4. Infrastructure damage,  
5. Loss of life,  
6. Loss of natural resources,  
7. Crop yield  
8. Soil erosion  
9. Increase crop yields  
9. Increase soil fertility  
11. Other (specify)

SECTION F: ENVIRONMENTAL DEGRADATION

1. What are the main natural resources that you use in order of importance?

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<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>f. Quarry stone</td>
<td>a. Soil (for brick making, agriculture etc)</td>
<td>h. Sand (for construction, bricks, etc)</td>
<td>i. Wildlife</td>
<td>j. Fish</td>
</tr>
</tbody>
</table>

2. Where do you source these resources?  

<table>
<thead>
<tr>
<th>a. Unprotected natural forests</th>
<th>a. Protected areas</th>
<th>a. Lake</th>
<th>a. Rivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Community forest sources</td>
<td>a. Others (specify)</td>
<td></td>
<td></td>
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</tbody>
</table>

3. How do you access them?  

<table>
<thead>
<tr>
<th>a. Purchase them</th>
<th>b. Permission from the authority</th>
<th>c. Fishing</th>
<th>a. Poaching/With out permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>e. Others</td>
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</tbody>
</table>
5. Do you think there are less trees than there were 10 years ago? [___]
   a. 1 = Yes, 2 = No
   b. If yes, what do you think is the major cause of this?

   |----------------------------|-------------------|-------------------|---------------------------------|-------------------|

   c. Do you think agricultural yield per acre has gone down than it was in the past 10 years? [___] 1 = Yes, 2 = No

   d. Are there any environmental problems that are affecting this area? i. Yes ii. No If yes, what are they?

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<th></th>
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</thead>
<tbody>
<tr>
<td>a. Land degradation</td>
<td>a. Others (Specify)</td>
<td></td>
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</tbody>
</table>

   e. In the next ten years, which natural resources will be more degraded? [___]

<table>
<thead>
<tr>
<th>i. Water</th>
<th>i. Forest and Trees</th>
<th>i. Indigenous rangeland</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. agriculture land</td>
<td>i. Wildlife</td>
<td>i. Fish</td>
</tr>
<tr>
<td>g. Birds</td>
<td>i. Others</td>
<td></td>
</tr>
</tbody>
</table>
SECTION H. ANTHROPOMETRIC MEASURES OF THE HOUSEHOLD MEMBERS

<table>
<thead>
<tr>
<th>S/No</th>
<th>Sex (F/M)</th>
<th>Age (months/years)*</th>
<th>Weight (kg)</th>
<th>Height/Length (cm)</th>
<th>MUAC (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
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<td>3</td>
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<td>4</td>
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<tr>
<td>5</td>
<td></td>
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</table>

SECTION H. ANTHROPOMETRIC MEASURES OF THE HOUSEHOLD MEMBERS
Appendix 2: Checklist for Focus Group Discussions and Key Informants

Climate change

1. Do you know about Climate Change?
2. Are there traditional events or indicators that tell you something about the change?
3. In your opinion, what features do you see in your area to indicate that the climate has been occurring?
4. What are the causes of CC?
5. What are the effects of climate change?
6. What challenges and constraints did you face in trying to adapt to climate change?

Land ownership

7. Do men and women have equal opportunity to own or inherit land? How?
8. What are the determining factors in land allocation by village government and by household/family?

Gender

9. What does gender mean to your community?
10. What are the main challenges for gender equity in your area?

Climate change and nutrition

11. Do you think CC affect nutrition status of this community? yes, how
12. What solutions have you put in place to alleviate these problems?
13. Does CC impact affect your eating behavior? Yes, how
14. Is there anything else you would like to share?
Appendix 3: Food frequency questionnaire

Please let me know the frequency to which your family and the study child consume the listed foods.

<table>
<thead>
<tr>
<th>List of foods consumed</th>
<th>Frequency of consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
</tr>
<tr>
<td>Ugali</td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td></td>
</tr>
<tr>
<td>Cassava</td>
<td></td>
</tr>
<tr>
<td>Sweet Potatoes</td>
<td></td>
</tr>
<tr>
<td>Plantain Banana</td>
<td></td>
</tr>
<tr>
<td>Beef</td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
</tr>
<tr>
<td>Beans</td>
<td></td>
</tr>
<tr>
<td>Sardines/Fish</td>
<td></td>
</tr>
<tr>
<td>Amaranthus</td>
<td></td>
</tr>
<tr>
<td>Pumpkins leaves</td>
<td></td>
</tr>
<tr>
<td>S/potato leaves</td>
<td></td>
</tr>
<tr>
<td>Garden egg</td>
<td></td>
</tr>
<tr>
<td>Oranges</td>
<td></td>
</tr>
<tr>
<td>Guava</td>
<td></td>
</tr>
<tr>
<td>Ripe banana</td>
<td></td>
</tr>
<tr>
<td>Pawpaw</td>
<td></td>
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<tr>
<td>Animal fats</td>
<td></td>
</tr>
<tr>
<td>Honey</td>
<td></td>
</tr>
<tr>
<td>Sugarcane</td>
<td></td>
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<tr>
<td>Sugar</td>
<td></td>
</tr>
<tr>
<td>Coconut</td>
<td></td>
</tr>
<tr>
<td>(Tetele)</td>
<td></td>
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</table>