THE IMPACT OF WATER SCARCITY ON RURAL LIVELIHOODS IN BELET HAWO COUNTY, SOMALIA

BY

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DECLARATION

This research project report is my original work and has not been presented for a degree or award in any other university.

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DEDICATION

I thank Allah who has given me this opportunity and the ability to finish my project. I dedicate this effort to my family and all other supporters that stood by my side throughout the project, encouraging me and piercing these documents together at all hours of the day and night.

ACKNOWLEDGEMENT

I would like to take this occasion to convey my gratitude to everyone who has helped me throughout this MA project. Prof George Okoye Krhoda and Dr. S. M. Kithiia, my supervisors, are acknowledged and thanked for their direction, encouragement, and support during this study.

My family, especially my mother and father, have been supportive, encouraging, and attentive to me. I also want to thank everyone who has helped with this project in any way, whether directly or indirectly.

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LIST OF ABBREVIATIONS

DFID	-	Department for International Development
FAO	-	Food Agriculture Organization
FSNAU	-	Food Security Analysis System
HDR	-	Human Development Report
IWMI	-	International Water Management Institute
MCM	-	Million Cubic Meter
MDGs	-	Millennium Development Goals
NGO	-	Non-Governmental Organization
SDGs	-	Sustainable Development Goals
SPSS	-	Statistical Package for Social Science
UN	-	United Nations
UNDP	-	United Nations Development Program
UNFPA	-	United Nations Population Fund
UNICEF	-	United Nations Children's Emergency Fund
USDA	-	United States Department of Agriculture
WHO	-	World Health Organization
WWAP	-	World Water Assessment Programmed

ABSTRACT

Water is a vital component of human life and a critical driver for socioeconomic development and environmental integrity in each place. It is a life-sustaining resource that is also vital to rural and agricultural development and affects the livelihoods of millions of people in rural areas around the world. Water scarcity is a problem that has a detrimental impact on the economy, livelihood, and environmental sustainability. Due to the growing population and children leaving school to get water from far away because there is an increase in the water demand. Rural areas have been under strain as a result of increasing population pressure, changes in land use activities, and climate unpredictability, and as a result, availability, accessibility, and sufficient quality and quantity of water have been negatively impacted.

The objective of this study was to see how water scarcity affected rural livelihoods in Balet Hawo County. The research was based on information from sources in form of a well-structured questionnaire from rural households and farmers, while secondary data was gathered from easily accessible web sources. A total of 127 rural residents from Balet Hawo county were sampled using stratified random sampling and structured questionnaires to determine their responses to the county's water scarcity.

From the study findings, Water price, household water demand, and distance between dwellings and water sources are all key factors of domestic water demand, according to the research. The livestock population has been quickly increasing, putting a strain on existing water resources, the quality of which has deteriorated dramatically as an outcome of increased man-made such as agricultural and animal production. Based on the study the Scarcity of water has reached an alarming level in rural areas, owing to a lack of water reservoirs, declining groundwater recharge, and rising water demand from livestock and households as a result of resource over-exploitation.

The study concluded, Population pressure, land use change, inadequate water management, and human activities led to the destruction of forests resulting in environmental degradation, decreased rainfall availability, displacement of rural people, and making life harder for people, according to the study.

CHAPTER ONE

1.1 Introduction

Globally, nearly 4 billion people suffer from severe water scarcity, and water has become a complex resource to manage (Mekonnen & Hoekstra, 2016). Developing regions are particularly affected by the water scarcity problem since farming is hazardous and has low returns, making livelihood diversification necessary (Adams, 2002; Knight & Song, 2003; Smiley, 2016). However, a lack of political support, poor governance, and a lack of investment have negatively impacted the sector. Over five hundred million people live in poverty, face ill health, and are at risk of flooding, environmental degradation, political instability, and conflicts around the world. These problems will become more severe due to population growth, increased consumption, and climate change (UNESCO, 2009). Pakistan is facing a water scarcity crisis; this is due to climate change and the way that the country has been using water resources, which is causing the water to be depleted more quickly than it is being replaced (Khair., et al 2011).

Developing regions are particularly affected by the water scarcity problem since farming is hazardous and has low returns, making livelihood diversification necessary (Adams, 2002; Knight & Song, 2003; Smiley, 2016). However, a lack of political support, poor governance, and a lack of investment have negatively impacted the sector. Over five hundred million people live in poverty, face ill health, and are at risk of flooding, environmental degradation, political instability, and conflicts around the world. These problems will become more severe due to population growth, increased consumption, and climate change (UNESCO, 2009). Several locations have serious freshwater management challenges. Water resource allocation, environmental quality, and water-use policy are all particularly concerning (Uitto, 2004). Water scarcity is the most fundamental constraint to long-term agricultural expansion, which is vital to poverty reduction. Water is considered an important part of food security (UNWATER, 2006) and the 2002 Sustainable Development Summit emphasized the importance of water resource management in achieving the Millennium Development Goals (UNWATER, 2002).

According to Ravenga and Cassar (2002), one billion rural areas worldwide still lack access to a sufficient and secure water supply. Water shortage has the greatest impact on rural areas since their livelihoods rely on it. Many regions are faced with rapidly increasing water demand as a result of increased population and economic development related with urbanization, industrialization, and agricultural growth (King, 2004). Recognize that demographic changes such as migration and urbanization have increased water demand., and that rural people are increasingly migrating to

cities to look for a better life. 2011 (Shatanawi and Naber). According to GWP (2015), competition for water among communities and pastoralists is fueling escalating tensions and hostilities in Somalia. As a result, water distribution is vital in Somalia, especially in the perennial river basins of the Juba and Shabelle rivers, which serve as the breadbasket for the majority of Somalis residing in Southern Somalia. (MoNR, 2013, AfDB, 2014).

Water scarcity has an impact on many aspects of development, including health, agricultural production, women's and children's knowledge, peace and stability, and economic productivity are all important factors. Because all of the issues are linked and overlap, any improvement in Africa's clean water supply has the potential to alleviate a wide range of development issues (UN water, 2006). Farming and rural expansion depend on it as a life-sustaining resource. It's essentially Climate change adaptation and mitigation are linked to global concerns such as food insecurity and poverty, and natural resource deterioration and depletion, all of which have a negative influence on millions of people around the globe. Water scarcity may occur in some countries due to the high annual average available water per capita. Those most affected by water scarcity live in remote rural areas (Ravenga & Cassar, 2002).

Hundreds of millions in rural and urban Sub-Saharan Africa do not have access to safe drinking water daily. Water resource management has grown increasingly vital as local, regional, and national water supplies become scarce, costly, and difficult to obtain. Many countries in arid and semi-arid regions facing water shortages are increasingly forced to look for alternatives to water resources. South Africa is the world's third driest country due to variable precipitation pattern and a high evaporation rate. Arid regions such as Namibia and Botswana receive more rainfall per capita than South Africa, which is considered a water-stressed country. While the global average annual rainfall is 1033mm, South Africa receives just 495mm. Severe water shortages, many rural populations in poor countries have been displaced. Food security in rural regions is affected due to water deficit. Resource pressure, race conflict, and water-related problems are also on the increase (Reuveny, 2007).

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In Africa competition for water increases due to limited resources and population growth which resulted from the depletion of the water point for instant, boreholes, rivers, and dug wells where water is not sufficient for all requirement needs. Water scarcity has an impact on many aspects of development, including health, agricultural production, women's and children's knowledge, peace and stability, and economic productivity are all important factors. Because all of the issues are linked and overlap, any improvement in Africa's clean water supply has the potential to alleviate a wide range of development issues (UN water, 2006). Farming and rural expansion depend on it as a life-sustaining resource. It's essentially Climate change adaptation and mitigation are linked to global concerns such as food insecurity and poverty, and natural resource deterioration and depletion, all of which have a negative influence on millions of people around the globe.

Water scarcity may occur in some countries due to the high annual average available water per capita. Those most affected by water scarcity live in remote rural areas (Ravenga & Cassar, 2002). Hundreds of millions in rural and urban Sub-Saharan Africa don’t have access to get water quality and safe drinks. Women are the first to be affected by a water shortage in rural Africa since they are responsible for both home and agricultural water responsibilities (Sass, 2002).

“Droughts and famines affect the Horn of Africa on a daily basis, especially Somalia being especially difficult damaged due to extremely unpredictable rainfall, infrastructure breakdowns, and the collapse of the national administration as a result of civil conflict" (Gadain and Mugo 2009). Women and girls, who are unable to conduct income-generating activities or attend school, play a critical role in gaining access to and transporting water. Every day, the majority of a woman's energy is spent walking long distances to find water for household purposes. The impacts of children, who face a shortage of clean water and proper sanitation under the age of five have been reported to die from diarrheal infections, dehydration, and malnutrition (Metwally et al., 2006).

IGAD member states are aware of the close relationship between conflict and water availability, or in the worst case, the lack of it. They know that reliable quantities of high-quality water with predictable availability are critical to the well-being of the population. The sustainable and equitable development, use and management of natural resources , supported by appropriate policies and legal framework s at regiona l, catchment and national levelis, is an integral part of transboundary water management in the region. This is because a significant part of the region's water resources originates from well-irrigated areas and gradually moves across the country's administrative boundaries to dry areas.

The current challenge Somalia confronts in providing its population with safe water is water shortage. The human population is extremely dependent on water supplies, not just for drinking but also for farming, raising animals, and fishing (UNEP, 2005). For many years, the lack of water resources in the nation has been a significant barrier to growth in industries including agriculture, tourism, energy, and industry. Freshwater availability is now trending downward, which may be ascribed to a number of issues, such as unequal water resource distribution, watershed degradation, water pollution, climatic variability, and rising water demandd asi a resulit of expanding human and animal populations.

In the past century, water demand has increased at a rate that has been more than double that of population growth. It is also worth noting that more and more regions suffer from chronic water shortages. For example, more than a third of the world'is populationis liveis in sub-Ssaharan Africa, where clean drinking water is not available (World Bank, 2006). One in three people worldwide suffer from water shortage, a problem that has a severe impact on Water shortages are becoming more severe as a result of population expansion, urbanization, and an increase in domestic and industrial demand. As a result, it motivates individuals to keep water at home. Additionally, this raises the possibility of contaminated drinking water and serves as a haven for mosquitoes that spread illnesses like malaria and dengue fever.

The GHA or IGAD sub-region is severeliy impacted by cli mate change , and water resource sharing is an issue. The region is currently experiencing extensive starvation, ecological degradation, poverty, and economic problems as a result of the region's frequent and severe droughts and floods. Because to insufficient water management infrastructure and procedures, irregular and unpredictables rainfalll patternsi, and hgh ambientt temperatures, the effectss of climate changee have been more severe (ADB, 2010).

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1.2 STATEMENT OF THE PROBLEM

Droughts and famines are common in Somalia, which is affected by extreme rainfall patterns because the rainfall is less and the water percolating insufficient, and civil conflict has resulted in infrastructure breakdowns and the collapse of the government (Gadain and Mugo 2009). Approximately a thirrd of the worlld population wiill experience wateri shortages in the 21st centtury. Water scarcity has become increasingly significant in the present century due to the increasing demand for water and changing laws and institutions. Changing laws and institutions and growing water demand will challenge economists in the future. According to Shatanawi and Naber (2011), water demand increased due to demographic changes like migration and urbanization. Water availability for humans, animals, and agricultural purposes is a major key barrier to people's livelihoods and blocks regional development (Gadain and Mugo, 2009). Despite having the most freshwater resources in Somalia, the basin is hydrologically inadequate, with seasonal gaps.

In the Gedo region and Bakool areas, German water engineering (Linger, 1985-1989) undertook a considerable hydrogeological survey. Every year hundreds of households are affected by drought due to low rainfall and environmental degradation as a result of poor climate, population growth, and income development. The other effect was the problem with contaminated freshwater resources; in sub-Saharan Africa, outbreaks of cholera, cholera, malaria, and dysentery destroyed thousands of people in the Gedo region, for instance, the signs are al-Shabaab and the conflict, but the causes include drought, poverty, and loss of livelihood are all consequences of a lack of representative government and the people experience inadequate water for their human needs (Nicholas S Robins and James Fergusson 2014).

Lawrence, et al., (2002), Water poverty is defined as a condition in which a community is unable to have enough money to offer clean, safe water to its citizens in sufficient amounts and at the appropriate times. People can be water poor if they don't have enough water to meet their

necessities, neither because it isn't accessible nor because the nearest source of water is a considerable distance away. The income and water poverty are inextricably intertwined. Therefore, reducing poverty will likely fail without a reliable and sufficient water supply (Sullivan 2002 and Meigh 2003).

The impact of water shortages is projected to be most intense when high rates of population increase and economic development are taken from severe environmental degradation, diminishing groundwater levels, and increased competition for water. Water is also used for useful purposes like agriculture and livestock production. However, in rural Belet Hawo, a rise in water scarcity has resulted in the death of Cattle, goats, and sheep are examples of domestic animals, affecting the county's livelihoods. The proposed will examine the effects of climate change, as precipitation and temperature patterns are expected to differ, with some areas receiving more rain and others receiving less.

Generally, the temperature has increased, causing water to lose and fewer humidity in the topsoil. Soil water is frequently the most significant impediment to increasing agricultural production and, as a result, reducing rural poverty. Water may be a major cause of low agricultural production for smallholder farmers in places with limited natural resource endowments, as well as a greater vulnerability to floods and droughts. ((J Kabubo-Mariara et al., 2007).

The most important water source is the Dawa River, collected mainly from donkeys (koreeto or gaari dameer), women, and children (Gichana, 2014). Water scarcity has been exacerbated by river water contamination and poor knowledge of rainwater harvesting techniques. Inadequate rainwater control measures and management are crucial constraints facing rural farmers, but also in terms of local livelihoods, socio-economic growth and environmental sustainability, and food production. Additionally, rural people do not have access to financial capital making them water-poor of society (Frans and Soussan 2004). The Horn of Africa is a hydrologically unstable, water-poor region that has already joined the list of countries suffering from water shortages. Agriculture is the most important economic sector of the region, and water use for food production, hydropower production and other purposes must be increased rapidly. Therefore, water sharing between competing water users is urgently needed to avoid conflicts over the use of scarce water resources in the region's rivers and to solve problems with traditional resource management methods in the basins.

Although Somalia's water supplies are limiited in both quanttity and qualiity, efficient water distribution is necessary when demand exceeds supply. A major obstacle to reducing Somalia's vulnerability to weather-related disasters is inadequate management of water resources. Somalia

lacks the necessary information to effectively manage water resources. The water distribution related to the studies has not been done, but the effective distribution of water among the water users of the Jubaa basiin will allow Somaliia to better control and manage its water rresources. This research focuses on how to effectively and sustainably allocate the available water resources in the basin between different uses to reduce conflicts between water users in Somalia, adopt sustainable water management practices, and improve people's livelihoods through efficient and effective water use. Droughts and famines are common in Somalia, which is affected by extreme rainfall patterns because the rainfall is less and the water percolating insufficient, and civil conflict has resulted in infrastructure breakdowns and the collapse of the government (Gadain and Mugo 2009). Approximately a third of the world population will experience water shortages in the 21st century. Water scarcity has become increasingly significant in the present century due to the increasing demand for water and changing laws and institutions. Changing laws and institutions and growing water demand will challenge economists in the future. According to Shatanawi and Naber (2011), water demand increased due to demographic changes like migration and urbanization. Water availability for humans, animals, and agricultural purposes is a major key barrier to people's livelihoods and blocks regional development (Gadain and Mugo, 2009). Despite having the most freshwater resources in Somalia, the basin is hydrologically inadequate, with seasonal gaps.

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1.3 The Research Questions

1. “What is the magnitude of household water demand for rural livelihoods”?
2. How have community factors affected water scarcity?
3. “What are the environmental factors contributing to water scarcity”?

1.4 Research Objectives

The main objective is to determine the impact of water scarcity on the livelihoods of the households in Belet Hawo County. The specific objectives are:

1. To determine the magnitude of household water demand on rural livelihoods.
2. To evaluate the impact of socio-economic factors contributing to water scarcity.
3. To identify the environmental factors causing water scarcity in Belet Hawo County.

1.5 Hypothesis

1. There is no difference between water demand and the rural livelihoods of communities.
2. There is no relationship between socio-economic factors and water scarcity.
3. There is no correlation between environmental factors and water scarcity.

1.6 Justification

The proposed study will investigate the impact of water scarcity on rural livelihood in Belet Hawo County, Somalia. Somalia is known for prolonged droughts that cause water scarcity, and degradation of the environment especially the ecosystems, diminish water supply, affect agricultural farming methods and food production, and interrupt the basic needs of the rural people. Uncontrolled population growth has resulted in Agricultural activities, deforestation, overgrazing, land use change, rapidly rising settlement pressure, and a loss of forest cover (DAAD, 2008). Surface run-off has increased during the wet season due to tree cutting for lumber and fuel, as well as overgrazing.

Meeting the difficulties of water scarcity may result in achieving some of the Sustainable Development Goals (SDGs) 6. SDG 6 is aimed at securing the supply of water and its long-term management, and sanitation than other freshwater environments. Wetlands, rivers, aquifers, and lakes are characteristics of water-related ecosystems that support a high amount of biodiversity and well-managed water-related ecosystems that help address competing water demands, mitigate climate change risks and reduce community conflict, especially among pastoralists. Resolving the problems of water scarcity is important for sustainable development, stability, security, and human health and well-being.

1.7 Scope of the study

The study area is Belet Hawo county in the Jubbaland state of Somalia. Belet Hawo borders Ethiopia, the North Eastern region of Kenya, and the Somali regions of Bakool Bay. The reason for choosing Belet Hawo County is semi-arid, experiences droughts and floods, and faces food insecurity. One of the major limitations is that the numbers sampled will reflect the limit of the researcher's budget and the time taken to distribute questionnaires to respondents and the overall security in the country. The results of the study will not be affected by these limitations but help in water resource development in the county.

1.8 Operational Definitions of Terms

Agro-pastoralists: refers to households that derive from agriculture more than 50% of household gross income (including income and consumption) and from livestock between 10% and 50%.

Household: refers to a domestic, social, or economic unit consisting of one or more individuals

who are members of a family living together with non-relatives such as servants and all depending on the same food and income source.

Household Water Scarcity: the percentage difference between the demand for household water and access to water.

Water Availability in Homes: the amount of water accessible to households to meet their basic daily needs.

Household Water Demand: the amount per household per day of water required.

Livelihood: is defined as the ability to provide for one's basic needs such as food, water, shelter, and clothing.

Pastoralists: Refer to households in which gross household income (including income and consumption) of at least 50% comes from livestock or livestock.

Rural: is a remote region far from the seat of government and has no infrastructure, where agricultural and livestock production was the main economic activity.

Water Stress: The relationship between total water availability and water usage is characterized as a scarcity of water, which can refer to scarcity of supply due to physical scarcity or scarcity of access due to institutions' inability to assure a continuous supply or a lack of sufficient infrastructure.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

A shortage of water results from a lack of innvestment or humman capaciity to meeti the demand for water in regions where it is plentiful. Inadequate infrastructure development, high sensitivity to climate variabilities, such as floods and droughts, and inequitable water distribution, even when infrastructure exists, are all indications of economic water scarcity. Arid regions, for example, are more susceptible to water scarcity due to the regularity with which droughts occur, and water scarcity is also more prevalent in locations where water supplies have been contaminated by pollution. A better understanding of water scarcity may be obtained by separating different factors that cause water shortages (FAO 2007).

Aquifer Reductions: The number of basins with long-term aquifer reductions or those with anticipated future declines, as well as their estimated capacity, are shown beneath.

Water stress at baseline: (WRI) It calculates the proportion of the total annual available flow that each of the three types of water withdrawals—agricultural, industrial, and municipal—takes from the total annual flow. Higher values imply greater user rivalry.

Advantages of Water Management Distribution of water management's economic and health advantages equitably: Society anticipates that essential services like water will be distributed fairly. Even if there may be injustice when some enterprises utilize water, the initial supply is intended to be managed and provided in a way that ensures a fair distribution of benefits.

Water Demand

Total water demand for agriculture, homes, and businesses, that is, demand for all purposes outside those related to the environment and the most fundamental human needs for drinking water.

The lack of water highlights the needd for betterr watter managementi. Effective water management also minimizes mosquito breeding grounds, which slows the development of water-borne illnesses and other insects that can transfer disease. People are compelled to consume water from dangerous sources as a result. It also implies that they are unable to properly wash, clean their houses and clothes, and this issue mostly affects women and girls. It has an impact on all facets of society and the economy, endangers the sustainability of the natural resource base, and puts whole communities' health at risk. However, women and girls are frequently the ones who suffer the most from it. It is closely related to the current state of poverty in society (IWMI, 2005).

Measurement water scarcity

According to California water sustainability, water is measured in the following indices.

- **Basic human needs index**

The index of basic human needs Gleick (1996) established a water stress index that measures the water required to meet fundamental human requirements such as cooking, drinking, and hygiene. It is assumed that 50 liters of water are required each day in total, with an estimate of 5 liters per person for drinking, at least 35 liters per person for cleanliness and sanitation, and 10 liters per person for cooking. These minimum needs are suggested as a starting point for water providers, independent of demand based on climate or culture.

- **Water stress index**

The water stress index describes the relationship between total water availability as well as water use. According to Rijsberman (2006), the water stress index is measured on the following indices;

Index (m^3/capita/year)	Class
>1,700	No stress
1,000-1,700	Stress
500-1,000	Scarcity
<500	Absolutely scarcity

Types of water scarcity

1. Physical water scarcity

Physical water shortage is most typically linked with arid places, but a frightening new trend is intentionally generated physical water scarcity as a result water resources have been over-allocated and over-developed. Physical water scarcity demonstrates itself in a variety of ways, including environmental degradation and an increase in conflict.

2. Water scarcity in the economy

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pollution. A better understanding of water scarcity may be obtained by separating different factors that cause water shortages (FAO 2007).

2.2 Household water demand and accessibility

The production of food or daily income for millions of people depends in one way or another on the availability of water. Water is essential for the life of many people, including farmers, small rural businesses, herders, and fishers. However, as the resources get scarcer, a growing proportion of individuals experience the disappearance of their sources of income (UNDP, 2006). Many people's livelihoods have been impacted, and others have chosen to diversify their economic pursuits. The outcome has been detrimental for some individuals, while others have turned to criminal industries including producing illicit beverages, over-using natural resources like sand, deforestation, overfishing and wood-carving, logging, and burning charcoal. Since many males have gone to urban areas, these duties are mostly carried out by women in the majority of rural areas. However, as the resources get scarcer, a growing proportion of individuals experience the disappearance of their sources of income (UNDP, 2006).

Many people's livelihoods have been impacted, and others have chosen to diversify their economic pursuits. The outcome has been detrimental for some individuals, while others have turned to criminal industries including producing illicit beverages, over-using natural resources like sand, deforestation, overfishing and wood-carving, logging, and burning charcoal. Since many males have gone to urban areas, these duties are mostly carried out by women in the majority of rural areas. Water is a crucial component of rural economic productivity when it comes to ensuring food security through the production of irrigated and rain-fed crops, as well as for industrial purposes, household processing, aquaculture, cattle, recreation, navigation, and power. Women are the primary producers of food crops and staples in certain nations. Yet some nations, notably those in the Middle East, focus more on post-harvest employment for women, who only perform unpaid household chores when there is a labor shortage. When it comes to water, they frequently suffer the most. The quality, amount, and cost of the water, as well as the costs of construction, operation, and money available will all influence the choice of a water source (2011). All of these factors can have a positive or negative impact on household livelihoods, while also providing vulnerabilities and risks if certain concerns are not addressed. Water availability, accessibility, usage, and quality all contribute to household water demand. Environmental factors like as hydrological change have a greater impact on availability (Osei, 2004). Providing fundamental human requirements is essential for household water demand and safety (Ariyabandu, 1999). water demand and security require convenience, consistency, and timely availability of abundant clean water to meet fundamental human requirements (Ariyabandu, 1999).

The household allows obtaining the necessary quality and quantity of water for their consumption and sustainable development. Availability, accessibility, usage, and quality are dependent on water sources. Water is mostly obtained from the Juba River, boreholes, shallow wells, and berkods, and is extremely limited. Due to the widespread practice of open defecation and the lack of a water quality management system in Somalia, the majority of open wells, berkods, and some shallow boreholes are likely to be contaminated (UNICEF 2016). Population expansion and significant agricultural and industrial water demand increases are driven by economic development. Global freshwater use has more than doubled since WWII, with a 25% rise anticipated by 2030. By 2050, there will be more than 9 billion people on the planet, up from the current 6.6 billion.

The quality, amount, and cost of the water, as well as the costs of construction, operation, and money available will all influence the choice of a water source (2011). All of these factors can have a positive or negative impact on household livelihoods, while also providing vulnerabilities and risks if certain concerns are not addressed. Water availability, accessibility, usage, and quality all contribute to household water demand. Environmental factors like as hydrological change have a greater impact on availability (Osei, 2004). Providing fundamental human requirements is essential for household water demand and safety (Ariyabandu, 1999). water demand and security require convenience, consistency, and timely availability of abundant clean water to meet fundamental human requirements (Ariyabandu, 1999).

Generally, the temperature has increased, causing water to lose and fewer humidity in the topsoil. Soil water is frequently the most significant impediment to increasing agricultural production and, as a result, reducing rural poverty. Water may be a major cause of low agricultural production for smallholder farmers in places with limited natural resource endowments, as well as a greater vulnerability to floods and droughts. ((J Kabubo-Mariara et al., 2007).

The most important water source is the Dawa River, collected mainly from donkeys (koreeto or gaari dameer), women, and children (Gichana, 2014). Water scarcity has been exacerbated by river water contamination and poor knowledge of rainwater harvesting techniques. Inadequate rainwater control measures and management are crucial constraints facing rural farmers, but also in terms of local livelihoods, socio-economic growth and environmental sustainability, and food production. Additionally, rural people do not have access to financial capital making them water-poor of society (Frans and Soussan 2004).

2.2.1 The distance and time took to water resource

Improved water sources save time and increase the overall water intake within acceptable distances from households. 200 meters is considered by (WHO, 2000) to be a suitable distance for looking at the water. Hetty *et al*. (1990) Borehole construction in Nigerian villages reduces every day collecting time from 3 hours to 5 hours, according to researchers. The Sri lank women's saved two hours (opportunity cost) per day by lowering the number of excavations from 8 to 3 hours per day to dig wells and springs for rainwater harvesting. Women might be improved by allowing them to spend more time and energy on education, increased employment, and social activities with so much time and energy saved. However, as resources become scarce, more and more people are losing their source of income (UNDP, 2006). Many people's livelihoods have been impacted, and others have chosen to diversify their economic pursuits. The outcome has been detrimental for some individuals, while others have turned to criminal industries including producing illicit beverages, over-using natural resources like sand, deforestation, overfishing and wood-carving, logging, and burning charcoal. Since many males have moved to metropolitan areas in quest of a better living, these activities are mostly carried out by women in the majority of rural communities.
The average distance to a water source has increased to 50 kilometers, which sometimes has to travel up to 25 kilometers to get water.

2.2.2 Scarcity of freshwater supply

Globally, water scarcity is rising (Rijsberman, 2006; Rockstrorn and Barron, 2007), with economic water scarcity affecting Sub-Saharan Africa in particular due to social, institutional, and financial constraints (CA, 2007).

Women in poor countries are compelled Gathering water for their families' daily needs, spending hours each day, especially in rural areas and among the destitute, putting a huge burden on their energy, productivity, and health." They collect water, wash clothes, clean, and cook as a result of their work, as well as undertaking day-to-day agricultural work in rural regions, women are at high risk of contracting water-related diseases. Infertility, concerns with baby and childhood health, disease, and mortality have all been linked to pollution and contaminated water sources (Carl, 2010). Severe environmental degradation, falling groundwater tables, increasing water distribution problems that benefit somie groupis at the expensie of otherss, and declining agricultural productivity are just a few of the symptoms. However, as resources become scarce, more and more people are losing their source of income (UNDP, 2006). Many people's livelihoods have been impacted, and others have chosen to diversify their economic pursuits. The outcome has been detrimental for some individuals, while others have turned to criminal industries including producing illicit beverages, over-using natural resources like sand, deforestation, overfishing and

wood-carving, logging, and burning charcoal. Since many males have moved to metropolitan areas in quest of a better living, these activities are mostly carried out by women in the majority of rural communities.

According to Descheemaeker et al. (2010), economical water stress is a condition of scarce water resources caused by the lack of human capacity or financial resources.

Many parts of the world suffer from a water shortage, but it is an essential resource for human health and the environment. “Women in poor countries are compelled to spend hours each day collecting water for their families' daily needs, especially in rural areas and among the destitute, putting a huge burden on their energy, productivity, and health.” They collect water, wash clothes, clean, and cook as a result of their work, as well as undertaking day-to-day agricultural work in rural regions, women are at high risk of contracting water-related diseases. Infertility, concerns with baby and childhood health, disease, and mortality have all been linked to pollution and contaminated water sources (Carl, 2010). Although safe drinking water is a well-known fundamental human right in Sub-Saharan Africa and other parts of the world, developing countries face numerous obstacles.

The increased struggle for scarce resources has come from the pressure within pastoral communities. Reduced competition for natural resources would be considerably reduced if water and pasture limits were addressed. The lack of access to water is certainly the biggest constraining issue for pastoralists. For more than 76 percent of the area, the average annual rainfall is less, often falling below 50 millimeters annually. As a result, there is high competition for water in many sectors, including domestic use, agricultural, and ecosystem needs.

Because water resources are effectively provided over time and space, Sub-Saharan Africa is experiencing the world's worst water crisis. Despite extreme water shortages, Africa utilizes barely 4% of its water resources (UNDP, 2007). (Hopkins, 1995). Despite Africa's lakes and rivers' enormous freshwater resources, water access and use are severely uneven. (UN-CSD, 1994). Rainfall around the equator provides the majority of Africa's freshwater, mainly in the Congo basin and the Niger Delta. Water demand is predicted to rise by 17% by 2025, because of mostly to agricultural development and population growth in emerging countries, while overall water consumption is expected to rise by 40%. (UNFPA, 2003).

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2.3 The socio-economic impacts of water scarcity

Water scarcity has resulted in a lack of suitable nutritious grazing pastures as well as a lack of drinking water for animals. When there is a drought, villagers are compelled to travel long distances in search of pastures or grazing areas as well as water for their cattle. As a result of livestock losses, some people have lost their source of income, as these animals (cattle, goats, and sheep) were sold for earning money. The proceeds from the sale of animals were used to pay school fees and, in certain cases, to acquire household needs.

Water collection's opportunity cost might have social and economic implications. When children are disproportionately responsible for collecting water, for example, the effect could be a loss of education, health, and safety, among other things. Carrying water late at night puts women and children in danger of harming themselves or becoming involved in situations that are harmful to their emotional well-being. Water-related disorders account for more than half of all hospital beds around the globe, according to (Lenton et al, 2005). “When there is a lack of funding and effective management to meet the demand of those who lack the resources to use the available water sources, economic water scarcity occurs; symptoms, in this case, include extreme environmental degradation, depleted groundwater, and unequal water distribution (FAO, 2007).” When people do not have continuous access to safe and inexpensive water for drinking, washing, food production, and sustenance, water is deemed precarious, whereas scarcity can be either physical or economic Molden (2007). Physical scarcity occurs when "available water resources are insufficient to meet all demands," as opposed to economic scarcity, which occurs when "investments required to keep up with rising demand are limited by financial, human, or institutional capability" (Molden, 2007). Water shortage is defined as a situation in which a country or region's annual water supply is less than 1000 m' per person. The significant issues for populations and economies are because accessible water is inadequate for food production and reduction of hunger and poverty in such conditions. Water scarcity is a problem that has a significant impact on the economy since it affects one out of every ithree peoplle on every continent.

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Due to a lack of safe drinking water, women and the impoverished, in particular, are sometimes unable to work (Joshi & Fawcett, 2001). Most people spend a significant amount of time each day traveling to the nearest water source, waiting for water for long periods, or being unable to work due to illnesses caused by contaminated water. This has a significant influence on the ability of both women and men to get jobs since they are unable to attend to their work regularly. “Many individuals are occasionally forced by the high cost of water, especially in rural regions, to spend money they can't afford to buy water from expensive water vendors who get their water from shady sources. The impoverished suffer the most because they lack access to water and sanitary facilities. Domestic consumers complain to the municipality that it is too costly. Legal, water rights, economical price, or physical limitations are among the issues that impede access to water, and their unequal resolutions lead to disputes (Janakarajan, 2002).

2.4 Environmental factors of water scarcity

Problems of water stress are one of the most serious risks affecting the globe at every level economic, social-political, and environmental levels. The conflicting demands for this finite resource emanating from homes, industry, and agriculture have significant consequences for the future of the nation as India continues to experience tremendous changes brought on by a growing economy and population. The lack of consistent water sources and a significant emphasis on groundwater are two major environmental issues that contribute to insufficient drinking water supplies. Considering geographical and geological factors, variability in rainfall, and a poor recharge level, groundwater has been changing and continuously diminishing in many areas (Gol, 2002). Without action, the issue would worsen since India is expected to develop rapidly in the

next decades and surpass China as the most populous nation by 2028. it is becoming severe as climate change exacerbates efforts to provide water to the increasing population. It is already causing problems in some parts of the world, emphasizing the significance of managing natural resources sustainably with enough infrastructure. Water scarcity is predicted to worsen in the subtropics and mid-latitudes, where many of the world's poorest people dwell (Meehl et. al. 2007). Although human factors and climate change are interconnected, environmental factors such as over-extraction and pollution are caused by human activities. These factors contribute to increased groundwater reduction and deterioration in the amount of water. The lack of consistent water sources and a significant emphasis on groundwater are two major environmental issues that contribute to insufficient drinking water supplies. Considering geographical and geological factors, variability in rainfall, and a poor recharge level, groundwater has been changing and continuously diminishing in many areas (Gol, 2002).

2.4.1 The conflict between water resources

According to (Nepomilueva 2017), There are two main causes of water scarcity:

Physical scarcity which begins naturally in arid or desert regions where availability of water is limited by nature.

Economic scarcity is noted as to a scarcity when water cannot be utilized due to the poor water management or lack of resources.

Molle and Mollinga distinguish three more factors:

- Managerial scarcity where there is poor management of water resources, such as water pollution due to the introduction of external substances in the water resources due to a malfunctioning water system as well as damages along the distribution water network.
- Institutional Scarcity-This is where the scarcity of water is brought about by poor management inability to cope with change and predict the demand and supply and to provide the required technologies.
- Political scarcity is where people are hindered from water resource access under a political prohibition

Freshwater scarcity is still a major resource issue for the world today. To keep up with population growth, the world's water demand climbs year after year. Water shortage and a lack of rainfall are key contributors to the social and economic problems that pastoralists and farmers face. Due to the same scarcity, rain-fed farmers are forced to convert more of their land to cultivable land appropriate for grazing. Pastoralists and farmers are always fighting for limited resources due to land scarcity Konczacki (1978) and Jacobs (1980). Growing water demands are leading to more

conflict on water uses, as well as disputes between domestic and agricultural purposes. In an area of water scarcity, the conflict between several different water users for limited water supplies is likely to become severe. (M Smith *et al*., 2009).

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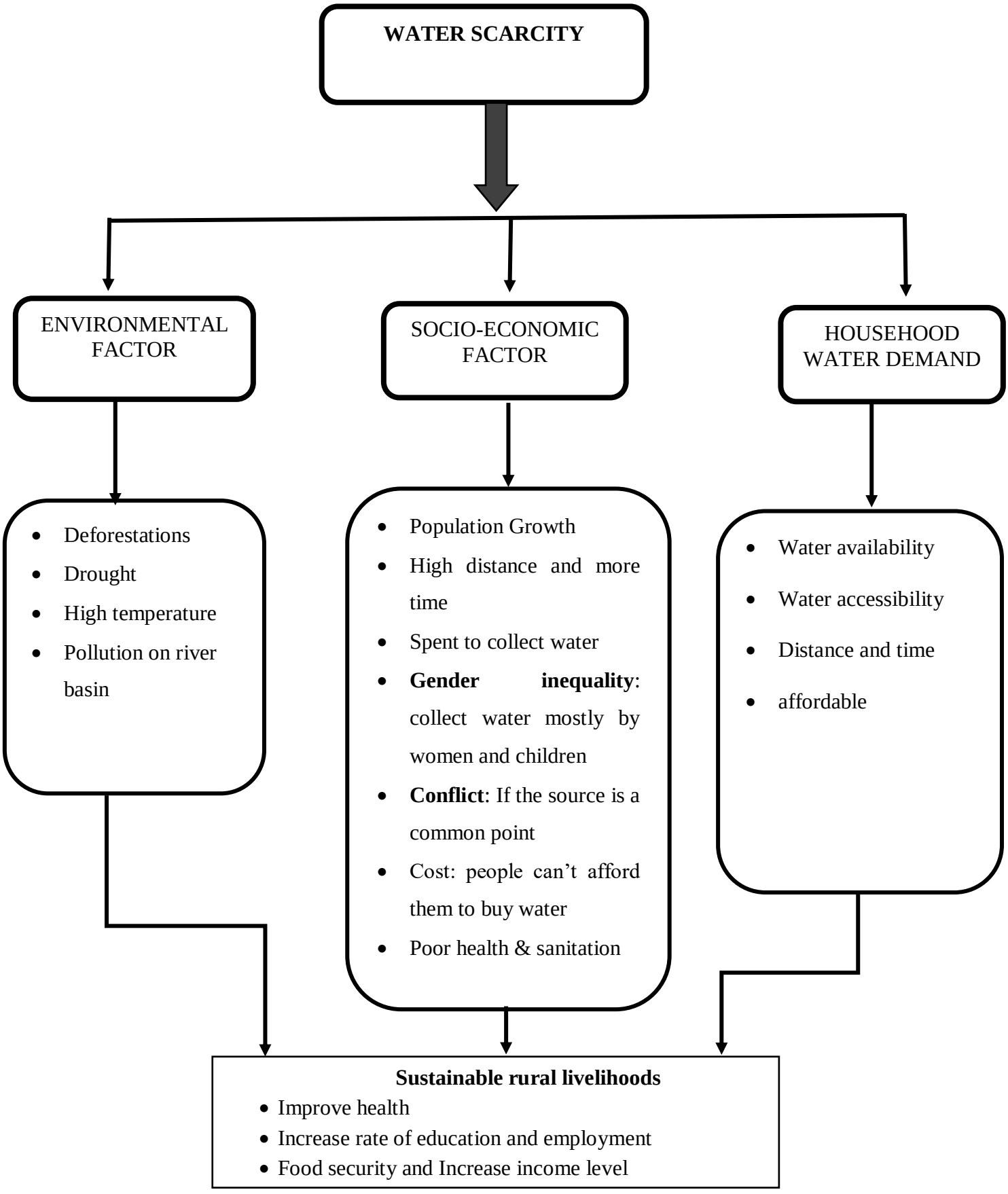
Countries are being forced to make difficult decisions when growing andd allocatiing watter bettween agriculturre and otheir usess of water resources due to increased competition for available fresh water supplies. Droughts, water shortages as a result of declining river flow, a lack of irrigation maintenance infrastructure, a poor institutional framework, and relationships with other communities and the development of rural people may contribute to disputes between agricultures water users. These disputes have grown in recurrence, intensity, and quantity of destruction and affect the verry subsistence oof tthe majoritty of rurall people (Adger and Brokes, 2001; Tarhule and Lamb, 2003).

2.5 Theoretical Approaches

"The impact of water scarcity on rural livelihoods is highlighted in this approach. Water, unlike other natural resources, may be regarded as a distinct resource due to its low economic value but a necessity, as well as its fugitive character" (Boge 2003:12,13). "The researcher chooses to operate on the theoretical framework of water as a scarce resource based on characteristics of water as a resource. Scarcity, by definition, means diminishing resources and/or increased demand for the supply of accessible resources. Scarcity is commonly described in three ways" (Ohlsson 1999:2):

1. Demand-Induced Scarcity as a result of rising population demands for water.
2. Supplyy-induceed scarcitty resultis from rivers drying up, decreased water tabbles, and pollutted groundwaterr and surfacce waterr systems.
3. Structural scarcity occurs when morre influential segmentis of water userrs obtain a more significant proportion of the scarce resource, resulting in the ecological and economic marginalization of the less powerful.

Figure 2.1: Conceptual Framework



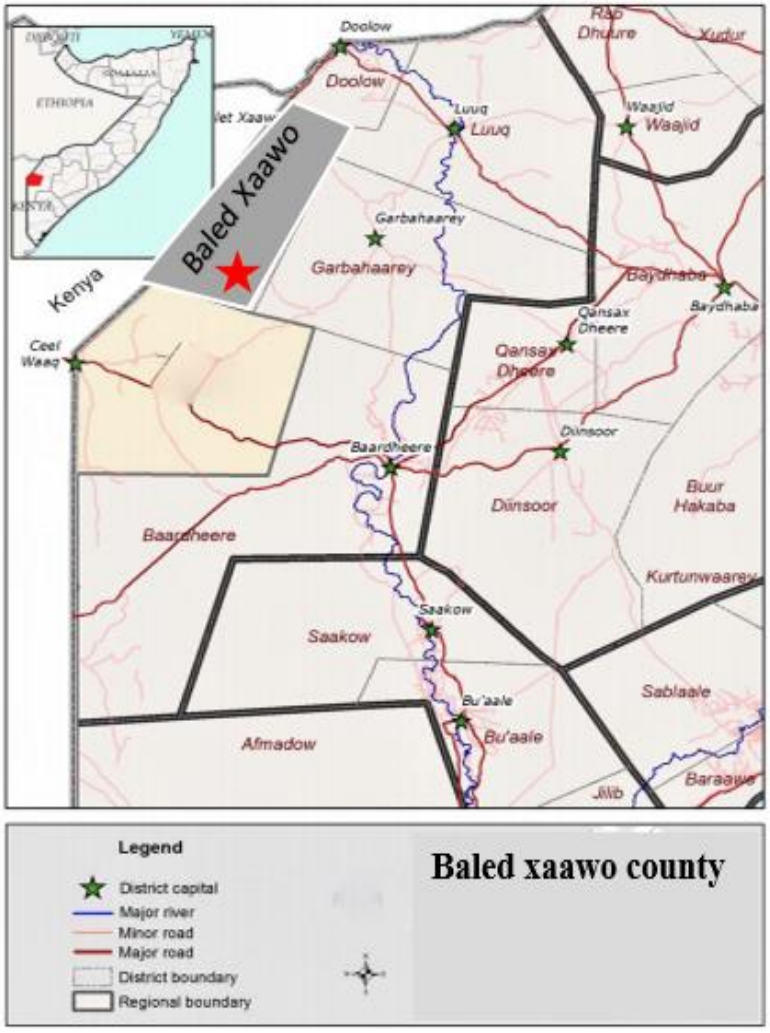
Source: Researcher's design

CHAPTER THREE: METHODOLOGY

3.1 INTRODUCTION

This chapter gives an overview of the study area, research design, Population, sample size and procedures, data collection, data analysis, and techniques.

Figure 3.1: Study Area



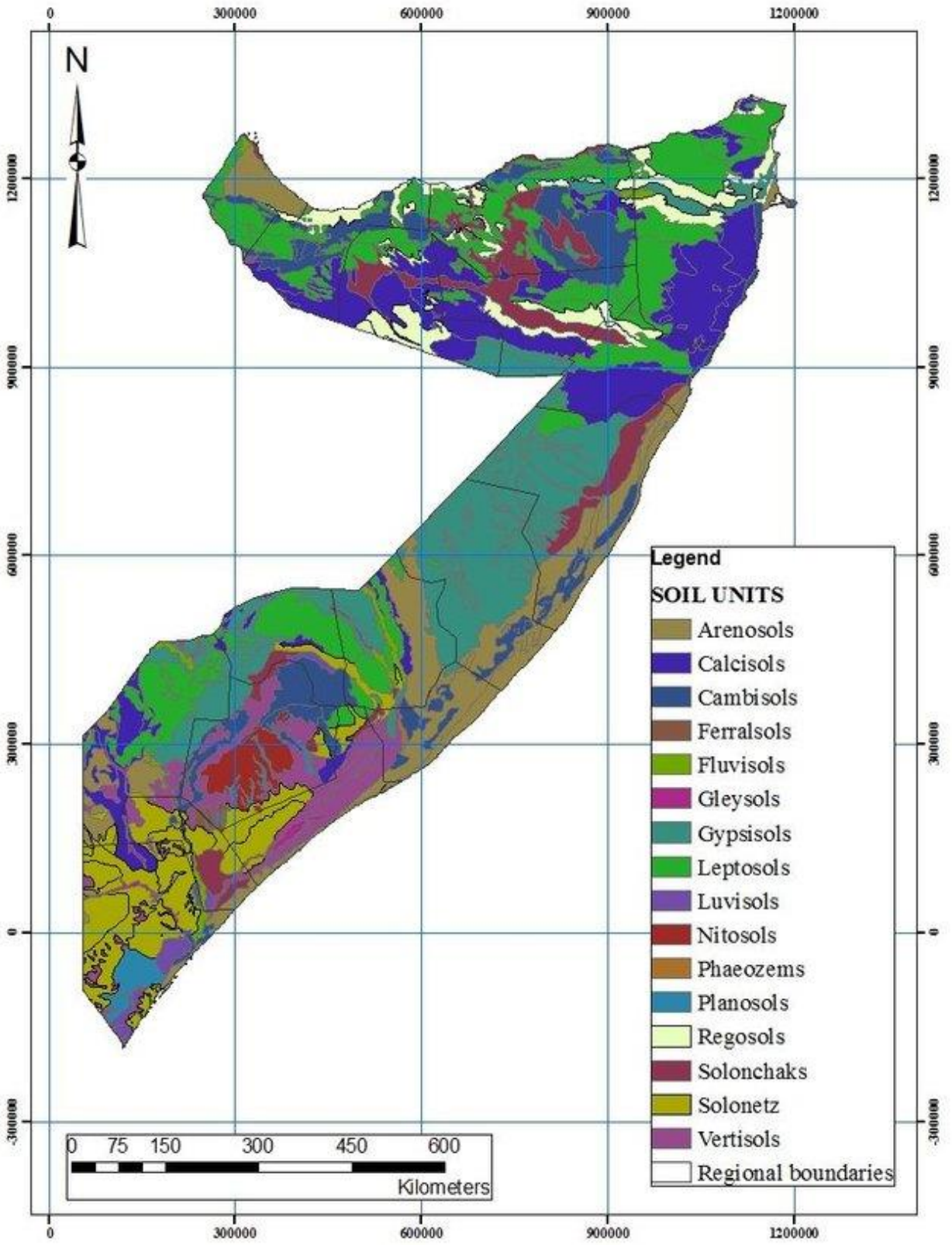
Climate of Somalia

The climate of Somalia is characterized by high temperature variations, high evaporation rates, high relative humidity and low precipitation. Four period of climatically change within the year are experienced in Somalia: in Somalia the rainfall occurs in two seasons, Gu' occur in April to Jun, while deyr occur in October to December and both of the season peoples cultivated their land as the way expected to get rainfall.

Livelihoods

Rural community of the Juba river mostly depends on farming and pastoralist and they relying on both rein-fed and irrigation. Livestock and agriculture are the backbones of Somalia's economy, and most people's livelihoods depend on these two sectors. Drought and flood are more Juba basin, and they constantly impact the people's livelihood. Droughts have also forced people to move their homes in the Horn of Africa, especially Somalia, where political unrest has exacerbated the situation.

Figure 3.2: Type of soil



Types of Soil and Land use

Depending on the climate and parent rock, several soil types exist. Thin, unproductive desert soils dominate the arid regions of northeastern Somalia. A vertisol is a soil having a high content of the growing clay montmorillonite, FAO and USDA soil taxonomy both agree on this. During dry seasons or years, this soil develops deep fractures. Crops such as maize, sorghum, and sesame can be grown when irrigation is available, as well as during the rainy season. Rain-fed farming is problematic since vertisols can only be farmed in a narrow range of moisture levels. When dry, they are exceedingly rigid, and when wet, they are extremely sticky.

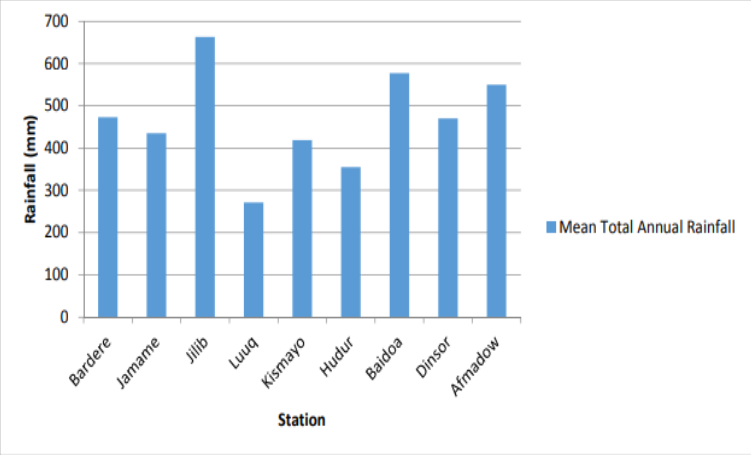
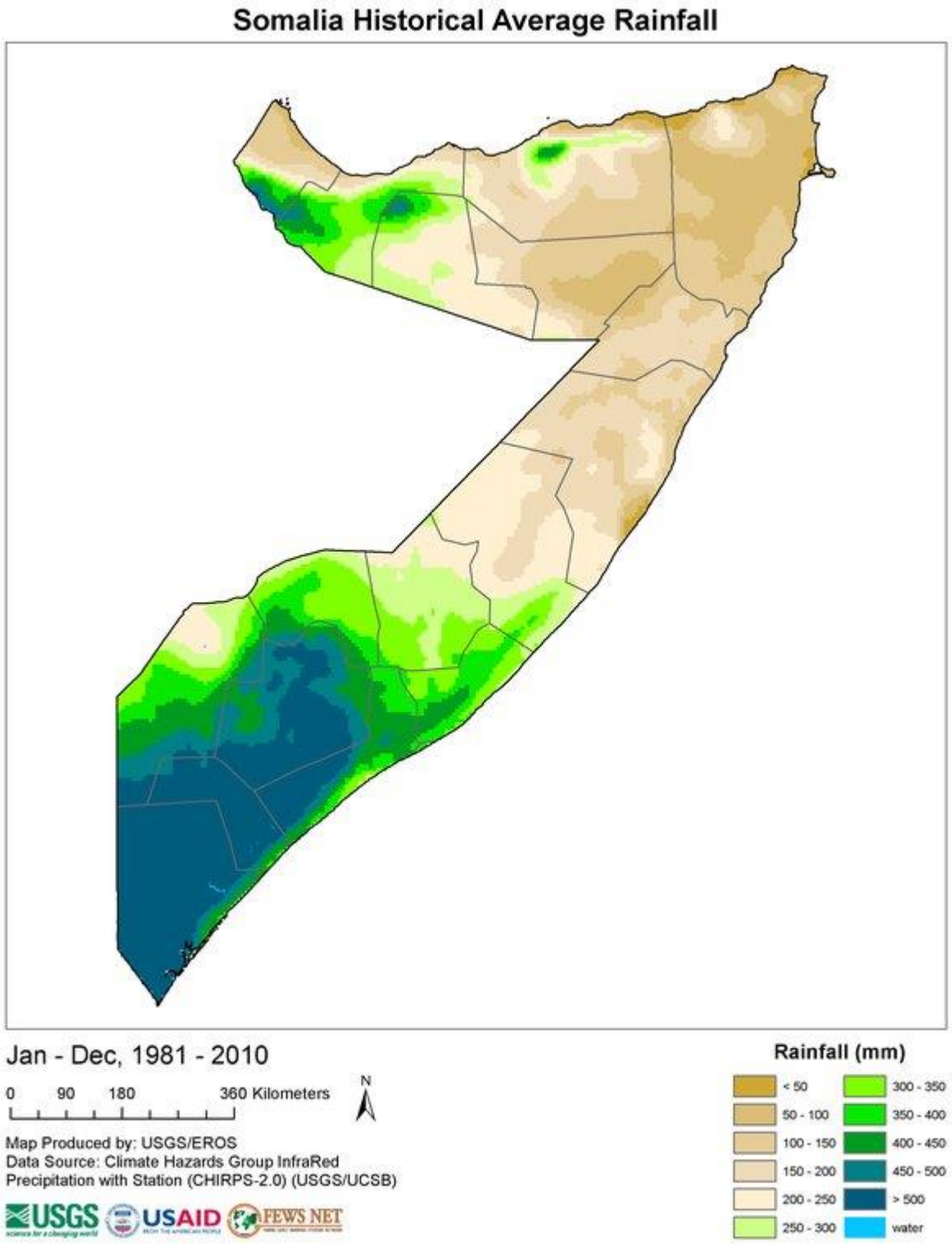


Figure 3.3: Juba station rainfall annual mean

Rainfall

"In most parts of Somalia, according to the IGAD Climatte Predictiion and Appllication Centter (ICPAC) seasonal forecast released durring the Greatter Horrn of Afriica Climatte Outtlook Forrum (GHACOF57), there are equal possibilities of experiencing abovve, averrage, or bellow averrage rainffall levels". Mild to moderate drought conditions are currently affecting areas in northern and central Somalia that were hardest hit by inadequate rainfall during the 2020 Deyr (October-December) season, resulting in water shortages and high water prices. Water tracking activities have been started by local authorities in these locations, with the areas of, Bari, and Mudug being the most affected by the water deficit. Parts of the Shabelle River's middle and lower reaches are generally dry, resulting in insufficient flow to sustain agriculture along the river.

Figure 3.3.1 Somali Historical Average rainfall map



3.2 Livestock Population

“Pastoralism is a major sourrce of incomme for peoplle in southerrn Somalia, and livestock water is essential. The inhabitants of the basin go about their everyday routines. Because cattle are used in botth agriculturre and livesttock management, the percentagge of cattlle in this region is larger than the percentage of camells and sheepp/goatts in Somalia's northern region. The animals are usually taken to rivers to be watered. However, during the dry season, there are disputes bettween nomadiic groups who bringg theirr livesttock to the riverrs and residents who live in riverine areas because the cattle destroy or consume the crops”.

Region	Cattle	Camel	Sheep	Goat
Middle Shabelle	443, 420	235,140	411,360	937,020
Lower Shabelle	43, 940	336,070	113,930	260, 280
Banadir	25,530	1140	7,720	24,710
Bay	116,080	415,230	71,150	260, 280
Bakol	296,000	220,230	102,160	356,590
Gedo	612,900	899,270	622,620	943,540
Middle Juba	424,860	252,300	31,130	937, 030
Lower Juba	999,450	254,640	87,170	165,280

Source: Ministry of Livestock, Forestry and Rangeland, department of planning and statistics, Mogadishu (cited by Muse, 1997 and Basynt, 2007)

Table 3.1: Distribution of livestock in Southern, Somalia

3.3 Study Design

This study investigated the impacts of water scarcity on rural livelihoods and employed descriptive and quantitative survey designs. According to (Polit, 1995), A descriptive survey's objective is also to observe, describe, and document characteristics of a situation as they occur naturally. On the other hand, a quantitative survey allows the researcher to collect data and information, summarize it, and analyze it using statistical software such as SPSS. As the study involves families, water sellers, and agriculture sectors, the study reduces well into descriptive research.

3.4 Population and Sampling

Belet Hawo County has sub-villages that are mainly inhabited by rural people. The total population is 17,341 people (Population and Housing Census, 2015 in Hirdo NGO) of which there are approximately five people per household. Individual houses (a total of 2,312 homes) and water service providers were used as the units of analysis, while the respondents from the sample survey served as the units of observation. To achieve an effective sample size from a sampling structure of all the households in the study of rural areas, simple random sampling of families from a stratified number of sub-counties and villages was used.

3.5 Sample Size and techniques

This study employed a stratified sampling method as defined earlier. In the stratified sample method, the villages were divided into sub-groups as shown in table 6. These sub-groups were divided into villages, from which a specified number of households were randomly sampled.

The sample size of different sub-villages was 127 respondents. Each of them was to collect data on their size. The entire drawn sample combined constituted the final stratified sample for further analysis. From the target population of 17,341 with a total of 2,312 households in the four rural areas in Belet Hawo County, the researchers selected 127 respondents as the sample size which represents the target people who come from the four villages where the data was collected.

Table 3.2: stratified divided table

Sub-County	**Number of households**	**No of people**	**The sample size of each stratum**
Tula aamin	1456	10920	127/17341*10920=80
Malkaharey	291	2183	127/17341*2183=16
Wargaduud	257	1928	127/17341*1928=14
Alango	308	2310	127/17341*2310=17
TOTAL	**2,312**	**17,341**	**127 Sample Size**

Source: Hirdo NGO Census2015

3.6 Data collection and analysis

For data collecting, both qualitattive and quantittative techniques were used. This research depends onn both primarry and secondarry datta sourcess for data collection. The questionnaire, interview, observation, and photography were the key data-gathering tools used in the study. The use of questionnaires in collecting data is considered a very fast and accurate tool and requires a smaller amount of resources. Secondary data was collected from the previous literature of the respective study.

Data analysis was completed along with the study objectives and research questions. Statistics of percentages and central tendency of study variables were evaluated using descriptive statistics. Results of the survey, interviews and observation charts were analyzed using Statistical Program for Social Sciences (SPSS) version 17.0 and Excel.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION, AND DISCUSSIONS

4.1 Introduction

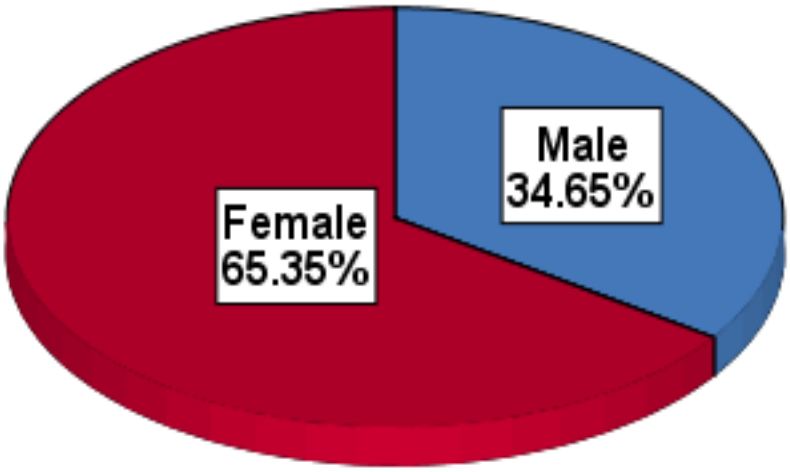
This section of the project paper reports on the findings of the analyzed data gathered from the respondents in the study. The section describes the study and gives a summary of these findings. This section uses tables, graphs, and charts to illustrate the details of the findings of the data analyzed. Descriptive analysis of household data has been used to find answers to research questions and objectives. socioeconomics and demographic characteristics.

4.2 Demographic characteristics

4.2.1 Gender

Female respondents were more than male respondents, with 65 percent of females and 35 percent of males, as indicated in Figure 4.1. This suggests that the data gathered accurately reflected how women deal with water scarcity issues as a group, as well as the survival concerns they confront.

Figure 4.1 Gender respondents



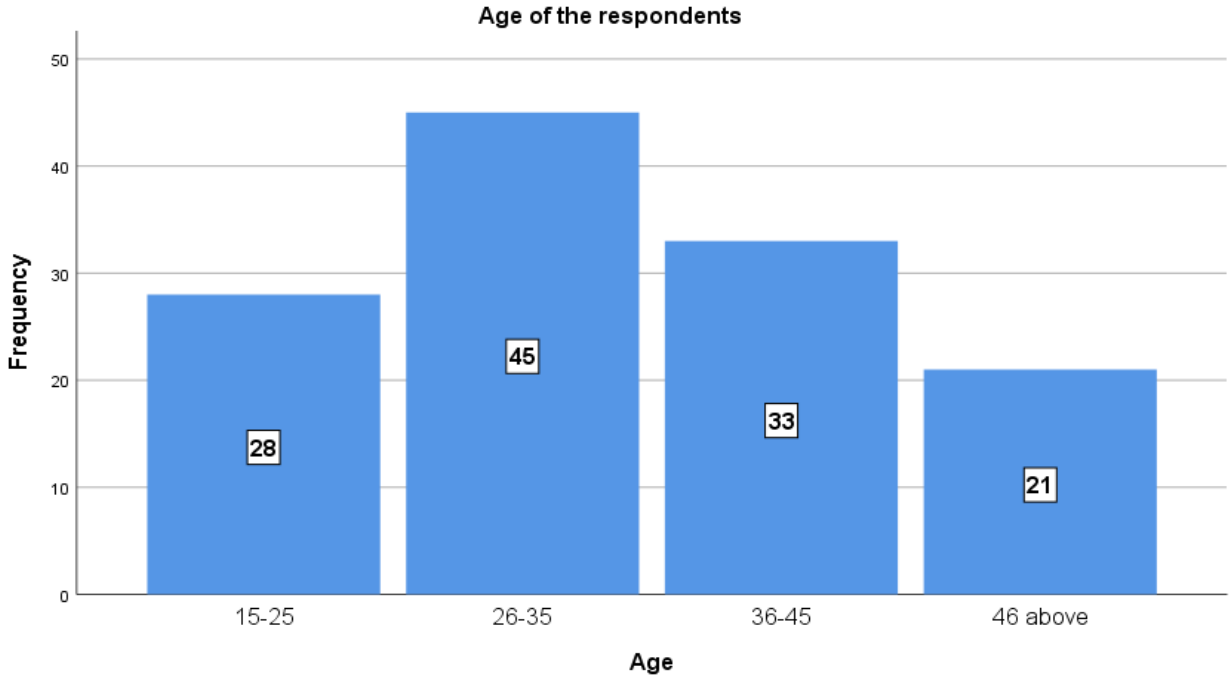
Source: Field Data 2021

They us e wate r for house chores su ch as cooki ng, washing, and drinking Purposes. I n wate r scarcity areas in Somalia women frequently spend three to four hours walking 6-7 kilometers daily to collect water. It also mentions that the average, girls, and women in the world countries have to walk about 10-13 kilometers daily to fetch water (Basnet 2010). The water for general household use is normally situated in remote rural areas that may be unsafe, thus women here are vulnerable to violence such as kidnapping and even rape.

4.2.2 Age group of respondents

The respondents of the study , the majority were aged between 25-35 years. This represents a percentage of (45%) as compared to those respondents aged 35-45 years who were represented by a percentage value of (33%). Meanwhile, the ages between 15-25 were represented by a percentage of (28%) even as the minority, which was the ages above 45 years represented (21%). Figure 4.2 give the details of these findings.

Figure 4.2 Age of the respondents

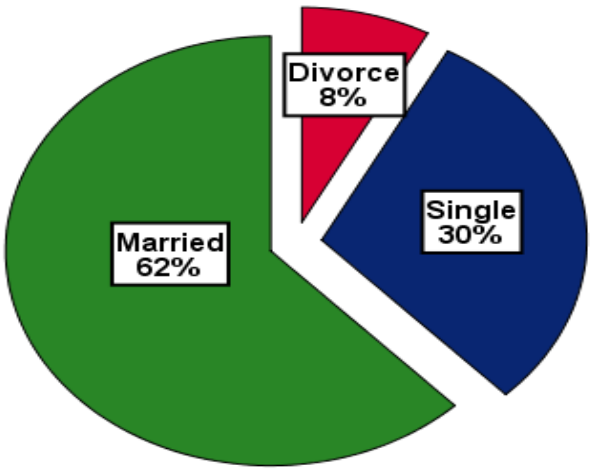


Source: Field Data 2021

4.2.3 Marital Status

Respondents with changed mari tal status are included in the study. The percentage of married people was the highest, followed by unmarried people. Sixty-two percent (62%) of those household members interviewed were married, thirty percent three (30%) were single, and eight percent (8%) were divorced. This information obtained is presented in the form of a pie chart

Figure 4.3 Marital status



Source: Field Data 2021

This is despite Because the majority of respondents were married, the majority of them depend on looking for food in the near towns and returning to their homes in the evening.

4.2.4 Level of education

The degree of education in the rural people's houses participated in the study was classified as elementary, secondary, vocational skills, and non-educational. Most respondents lack education, while others have primary and secondary vocational skills. Due to a lack of a policy framework to guide the sector, Somalia's education system was ranked last in Africa (World Bank 2006). The information is presented in the table below.

Table 4.1 Education level of the respondents

Levels	Numbers	Percent
Primary	14	10.9
Secondary	2	1.6
Vocational Skills	10	7.8
Non-Education	101	78.3
Total	**127**	**100.0**

Source: Field Data 2021

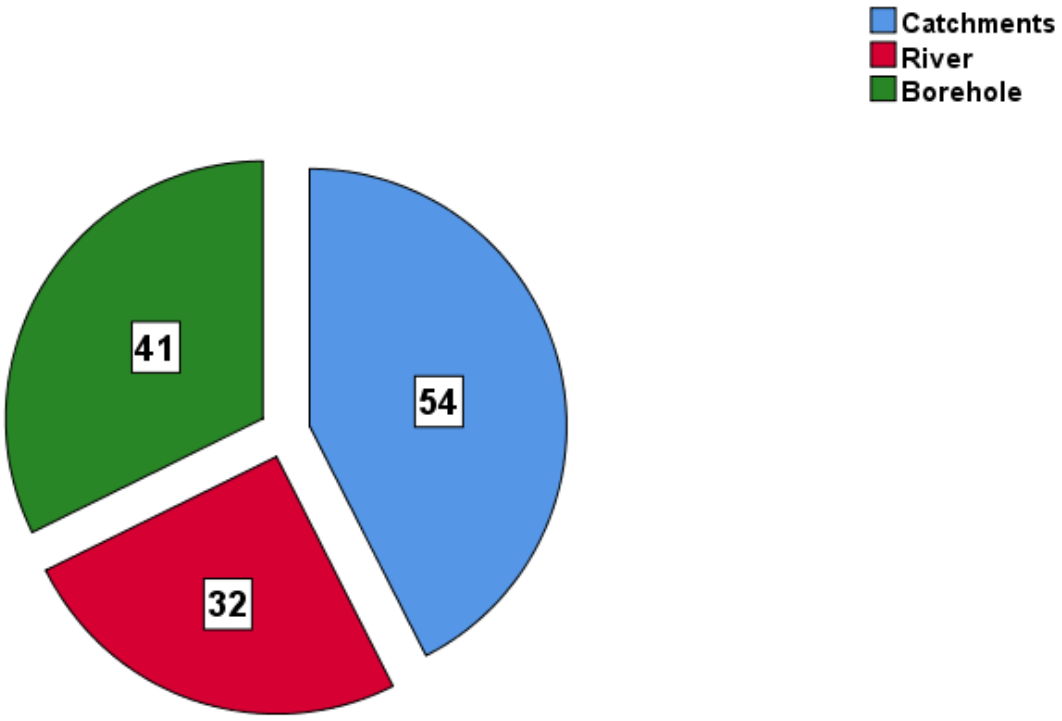
Mosit of the respondentis (78.3%), the ihighest percentage in this study, did not have an education level, followed by those (10.9%) who had attained education up to the primary class. In comparison, 7.8% had only vocational skills, and the secondary education level of the respondents was 1.6%, which is the lowest percentage due to low income and wasting time looking for water, which affected the number of students who dropped out of school. Education generally aims to increase human dignity in income distribution and improve access. The quality of education relative to the people is essential for socioeconomic growth and productivity, to increase individual self-interest, and, therefore, to reduce incomes, inequality, and poverty to achieve an educated community.

4.2 Household water demand

4.2.1 Type of water source in the rural household

The study's first objective was to find a water source for rural people in Belet Hawo county. The first objectives were to analyze the water source in Belet Hawo county. The primary water sources for the rural households were boreholes/wells, rivers, tap water, and During the rainy season, they collect water and store it in tanks, among other things. Boreholes and hang dug wells beside rivers are used by the majority of rural communities. As I mentioned earlier, the rural household also gets water from several points. Figure 4.4 below shows the water sources in rural areas during the vulnerable seasons. The majority of the respondents get their daily water from catchments/reservoirs (54), whereas (41) depend on river water in their daily water uses, while (32) obtain the water from river water.

Figure 4.4 Source of water in the rural household



Source: Field Data 2021

According to the respondents, these water points are located as far as 3kilometeres to 7 kilometers away from their homesteads. The most affected people are those who are dependent on catchments and rivers, and who have to collect polluted water. Water contamination may be caused by farm chemicals such as fertilizers, animal waste (remember, most livestock farmers feed their cattle directly from rivers), or even individuals doing their laundry within a few meters from where others receive their drinking water.

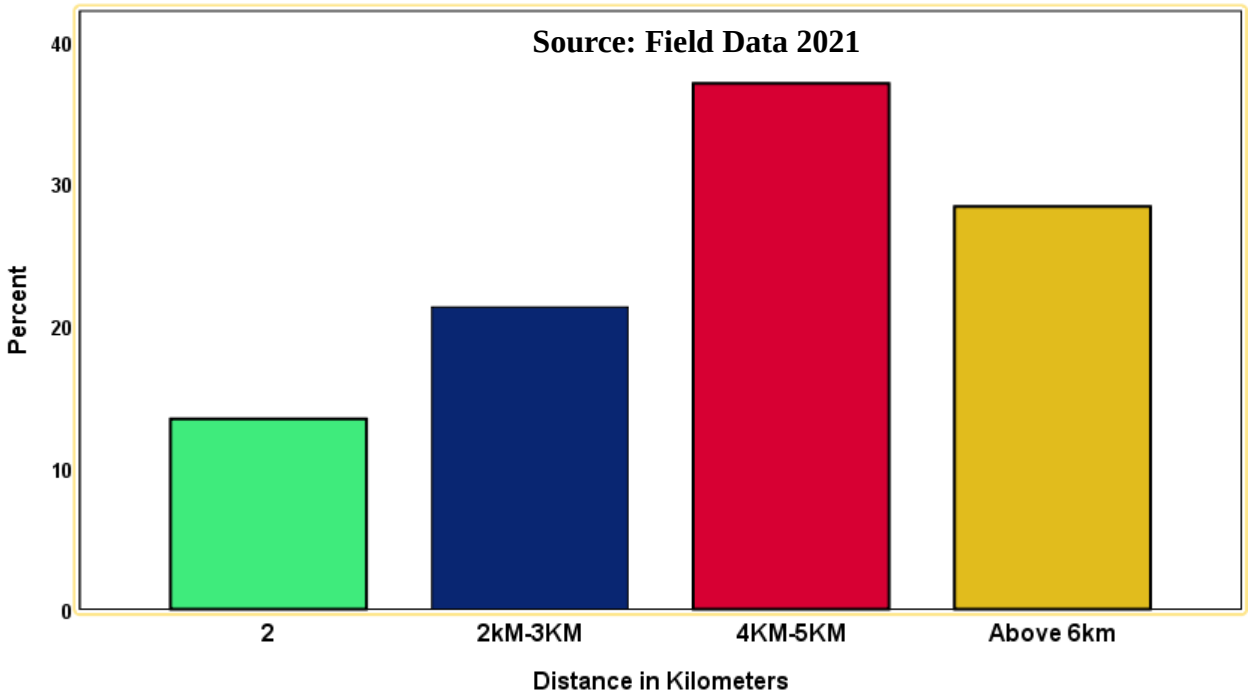
4.2.2 How far is the water source (well/ boreholes) from your household in meters

"According to the data, women are the most affected gender by distance, as they are most involved in household water collection. The larger the household, the more trips they make to water sources to meet the more critical household water needs". The respondents vary the fetching for water over a long distance, respondents indicate 4km-5km is the highest number of the respondents to spend more time, during the dry season they look for water over the long distance to get enough water for their families, the distance is 6km, the rural residents of Belet Hawo county spend less than two hours fetching water in the dry season, each with an average walking distance of 2 kilometers.

Photograph 4.1: Fetching water with long distance

Photo 4.1 above indicates the women travel long distances for freshwater since they are involved in the majority of domestic duties that need the usage of water.

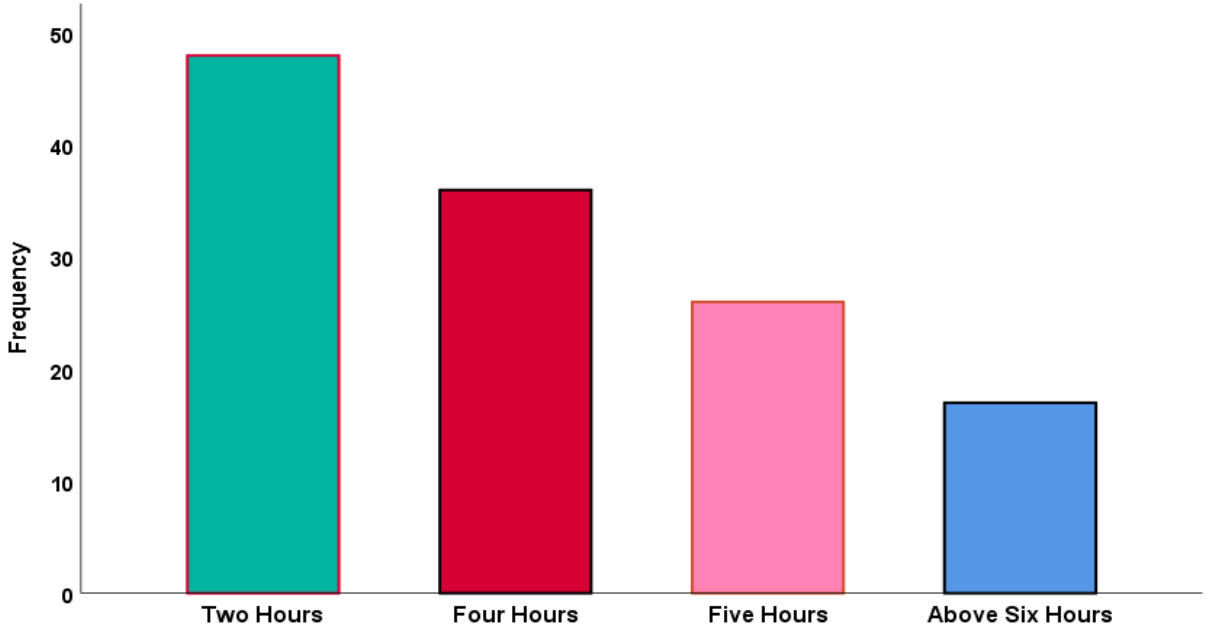
Figure 4.6 Long distance looking for water



4.2.3 Time to spend fetching water in days (hours)

Most respondents noted that they get less than 30 liters of water per day per person. Some say that they can get 10 liters per day for their use per person. Some families have access to basic sanitation. Private water suppliers might charge high fees due to a lack of regulation, leading families to use potentially hazardous open wells. Water collection is typically the job of girls and women, and it can be a challenging task. At water sources, many women and children suffer violence and the possibility of physical or sexual assault. Because they are fetching water, they have less time and are unable to attend school or work. The collecting water from the water points varies from one place to another, the majority of the respondents show that two hours are the most significant water fetching spend their time, while four and five hours are the second to the largest looking water, meanwhile, six hours and above are the lowest numbers which the respondents show their thoughts. Long distances and time spent collecting water from different sources of water by women and children diminish household water consumption and hurt water demand. The household water access is less than 1 kilometer in the wet season

Figure 4.7 More time to spend fetching water



Source: Field Data 2021

4.2.4 The water needs for households per day

Households require more water to meet human water consumption, whereas women are the primary water collectors and, in certain situations, daughters assist them. “During the dry season, girls skip school to assist their mothers in finding water for the family. Furthermore, key informants stated that women were overwhelmed with all home tasks and water collection, which took up much time that could have been spent on income-generating activities. The increasing distance to water points forced lactating mothers to travel more than 2–5 km to get water while carrying their babies on their backs. As you can see in table 4.2 below, the majority of the respondents used donkeys (58.9%), while the others varied distances looking for water and the water point, and they used wheelbarrows (30.4%), while (7.2%) and (3.5%) are the least of the respondents”.

The transportation of water using wheelbarrows

Source: Field data 2021

Domestic Water Demands

The total water consumption by rural people needs is 20 liters per day and the total content water quantity to about 52.2 MCM yearly. Given the current rate of urbanization, total domestic water consumption in 2035 is expected to be around 130 MCM. The Balet Hawo county has been hit by a string of bad rainy seasons, resulting in serious water scarcity. Both the Gu and Deyr seasons (April-June and October-December) performed poorly in the Gedo region, with some places outright failing. The dry season has been unusually severe, resulting in the dwindling of all temporary water sources.

Table 4.2 Water needs for household demand per day

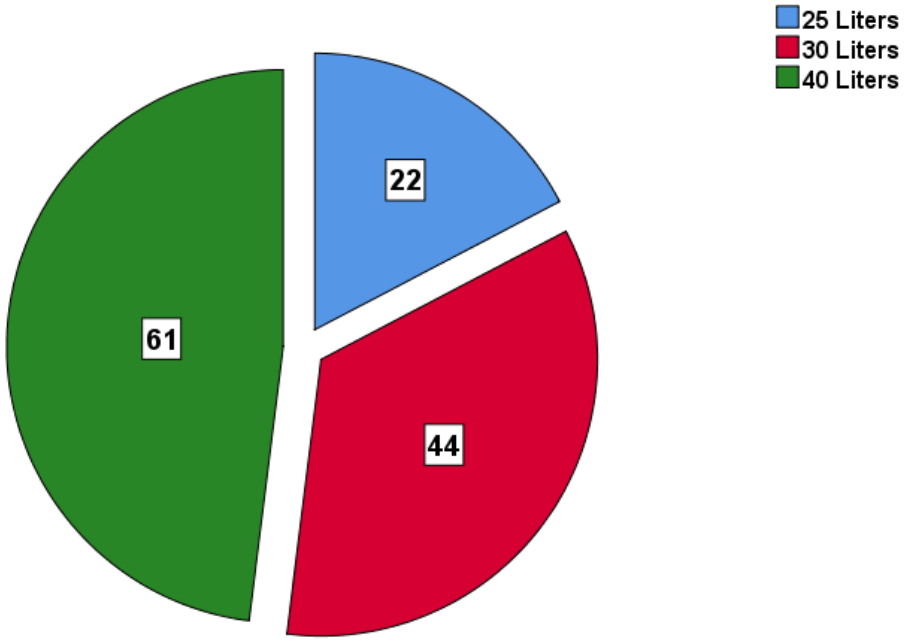
Descriptions	Frequency	Percent	Valid Percent	Cumulative Percent
20 Liters	4	3.5	3.1	3.1
40 Liters	8	7.2	6.3	9.4
50 Liters	39	30.4	30.7	40.2
70 Liters	76	58.9	59.8	100.0
Total	**127**	**100.0**	**100.0**	

Source: Field Data 2021

4.2.5 The livestock water in the rural people per day

In Somalia, the Pastoralist provides the Somali people with their primary source of income, and it feeds more than 60% of the Somali population (Ministry of National Planning 1982, CSD 1984). Considering daily water needs for sheep/goats, camels, and cattle are calculated to be 1.6, 12, and 25 L/d, respectively, the basin's total daily water livestock requirement is 114 000 m3 (Basnyat 2007). However, according to the FSNAU (2012), there is a movement toward more livestock rearing, and the growing population will certainly require a larger volume of livestock-related products. For most households in the Gedo region, livestock production and marketing are their most valuable asset. The result shows that most respondents indicated 40 liters of water needed per day per livestock which is (61%), while from the analysis 30 liters of water needed (44%), meanwhile (22%) indicate 25 liters are not sufficient but a small number of people response these findings.

Figure 4.8 Livestock water demand per day



Source: Field Data 2021

Poor rainfall has a significant impact on the depletion of key pasture resources. Permanent water resources decrease the number of rural people and this is reflected in the price of water. During the dry season, animals may travel a long distance between both water and pasture, and the only available water is found along the rivers. Only villages with shallow wells and those along rivers have access to water, and pasture quality is increasingly diminishing.

water demand for livestock during the dry season

Source: World bank

The water table in most of the area is normally depleted in vulnerable areas, so people commonly dig temporary shallow wells to water their livestock. It is estimated that around 80% of animal water is received from these sources dug in tog beds. When the water table declines, the animals move away from the boreholes, allowing the fodder species to recover.

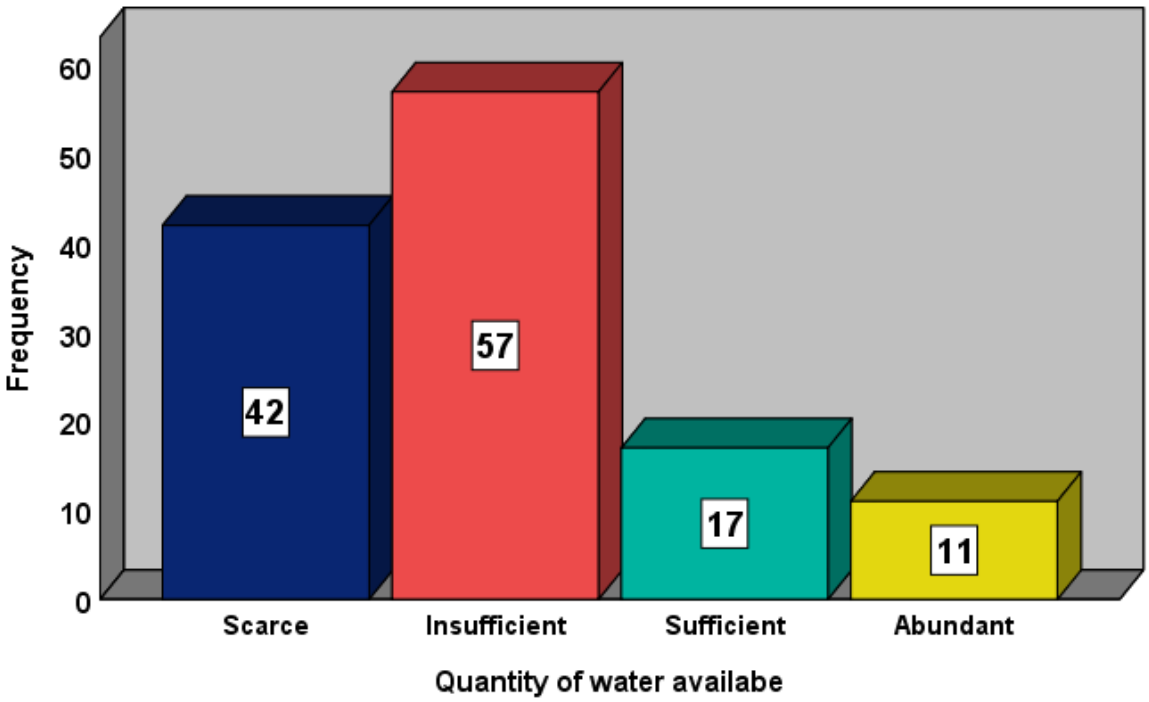
4.3 Socio-economic impact of water scarcity

The study's second goal was to look at how water shortage impacts the environment. economy on rural livelihood in Belet Hawo county. To achieve the objectives, the study looks at the quality and amount of water available to rural households, when water bodies dry up.

4.3.1 The amount of the available water

“Respondents were also asked to rate the amount of water available in their area. According to the study, 57 percent of respondents said the water was insufficient, 42 percent said it was scarce, 17 percent said it was adequate, and 11 percent said it was plentiful. This suggests that there is a water shortage in the area. The analysis findings are depicted in the diagram below”.

Figure 4.9 Quantity of water available charts

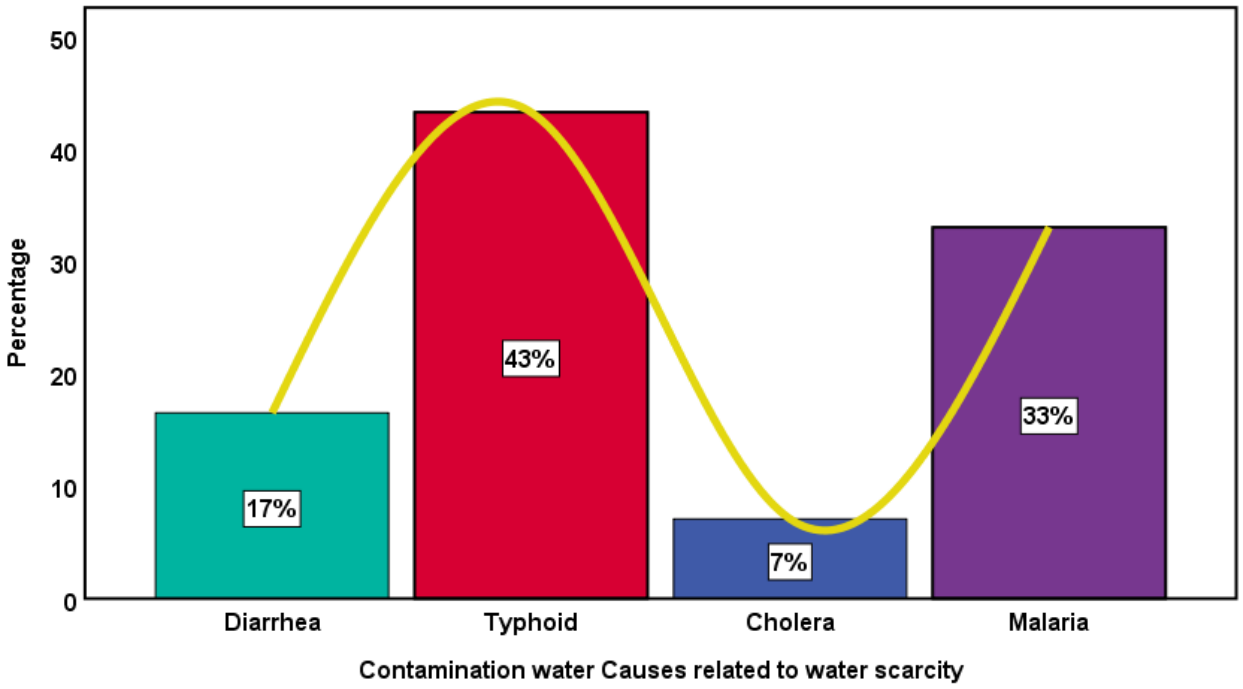


Source: Field data 202

4.3.2 Contamination of water cause related to water scarcity

The research investigated the water-related disease in Belet Hawo County. Water scarcity adversely affected human health. According to Ahmed *el* (2006), the scarcity of water causes rural poor people. The most significant health issue among children, as a result of water scarcity, include diarrhea, vomiting, and fever. The most common water-related disease is diarrhea (especially in children under five years), typhoid, malaria, and cholera common amongst people living in the vicinity of watersheds and springs. unsafe clean, and basic water sanitation because water supply systems are damaged and buried. According to the United Nations, more than 700 chiildren undeir the agei of 5 die every day from diarrhea, which is caused by a lack of sanitation and pollution where there is not enough water. The figure below shows the respondents indicate most rural people often get contaminated water scarcity (43%) typhoid, some respondents said the number of people who are getting malaria in the rainy seasons (33%), while small numbers of respondents indicate that (17%) diarrhea and cholera which is of the rural people (7%).

Figure 4.10 Contamination of water causes related to water scarcity



Source: Field data 2021

4.3.3 Cos of water on rural livelihood

From table 4.3 below, the cost of the water was evidently in Belet Hawo County. In disadvantaged locations, 60.6 percent of respondents pay $1 for 20 liters of water jerry-can., (27.6%) spend 0.5$ per 20 liters of water, while a small number of people indicate that (11.8%) spend less than 0.5$ on water jerrycan. Most surface water sources dry up during the dry season, putting extra pressure on existing groundwater sources, which leads to congestion, high water price, and population displacement. During the dry seasons (Jilaal), surface water and some shallow wells started to dry up, increasing the distance traveled to the water source which also increases the cost of water in the dry season. These challenges facing mostly the rural people and the lack of institutional framework and also the destruction of water sectors during the civil war are the result of the migration of people from theiir viillages to other areas wherre water and agriculture are satiisfactory.

Table 4.3 Cost of water per liter

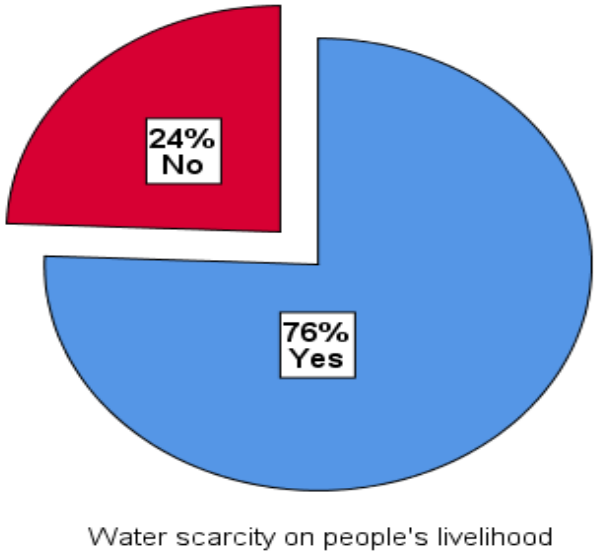
Descriptions	Frequency	Percentage	Cumulative Percent
Costly	77	60.6	60.6
Cheaper	35	27.6	88.2
Affordable	15	11.8	100.0
Total	**127**	**100.0**	

Source: Filed data 2021

4.3.4 Water scarcity affects people's livelihoods

The purpose of the survey is to see if respondents believe that water scarcity has an impact on people' s livel Ihoods. According to the findings, water shortage has an effect on people's livelihoods, as noted by the majority of respondents (76 percent). Water scarcity, on the other hand, does not impair people's lives, according to 24% of respondents. majority of rural people live in extreme areas and underdeveloped conditions. Agricultural production and pastoralism are the basis of livelihoods, with little opportunity to earn a living income. Despite a mitigate the risks from the 2011 famine and food insecurity, with several seasons of rainfall and a drop in water level, the situation is worsening in rural regions. These have led to near-total crop failure, limited rural employment possibilities, severe water, and pasture shortages, and an increase in li vestock fatalities as a result of these factors due to lack of water and overgrazing in the range land areas. Poor families' access to food is rapidly decreasing as local staple food costs continue to rise sharply and animal prices go down. Rural people lost their animals from disease and drought hit, and the cost of purchasing food commodities has grown by around 50%, whereas the cost of livestock has decreased by 30% to 50%. Long traveling distances to nutritional centers, failure by families to identify malnutrition among children or high potential feeding practices are all factors that affect children's nutritional status.

Figure 4.11 Water scarcity on people's livelihoods



Source: field data 2021

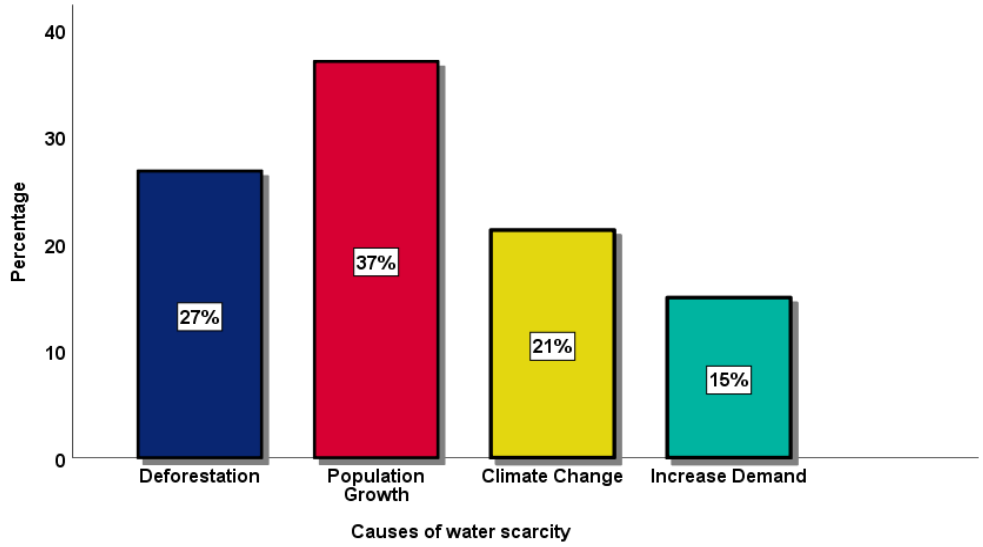
4.4 Environmental factor of water scarcity

The third objective of the study was to investigate the environmental factor of water scarcity in rural livelihoods. The research questions sought to find out the environmental factor leading to water scarcity. The increasing population of rural people double in the last couple of years and the exploitation of resources will also be increasing.

4.4.1 Causes of water scarcity

The unpredictable weather pattern that has made rainfall very hard to come by has been noted to be the biggest cause of water scarcity in rural areas. Among the respondents; 47% said there's huge population growth in terms of increasing livestock and people with limited resources. Deforestation is the most challenge facing rural areas, 34% indicated there's massive destruction of cutting trees which resulted from the reduction of precipitation. 27% said there's climate change in which the rainfall pattern changes every year and the competition for water increases during the dry season. While 19% of the respondents indicate their insufficient rainfall in the rural areas and increasing the number of livestock that is needed. There are two other things to be worried about potentially, one is population and the other is climate change, the only problem is that those people with the most population growth that you have got tend to be in dry countries and poor countries. Sub-Sahara Africa is where you're going to get most of the population growth. The output in figure 4.12 describe the pattern

Figure 4.12 causes of water scarcity



Source: Field data 2021

4.4.2 factor affecting conflict on water demand

According to the analysis, 75% of respondents agreed that there were conflicts, while a few said there were no water resource-related conflicts. Water scarcity has enhanced conflicts in the country, revealing that pastoralists have set against non-pastoralists while fighting for water. Every individual fights to gain it as a primary resource, resulting in misunderstandings and, at times, warfare. The majori ty of the respondentis, 46%, noted that water scarciity leads to interaction between the water users because of insufficient water demand. 35% of respondents said there is population pressure due to insufficient resources and that this will cause conflict between users. Due to the overexploittation of the water and the lowering of the water tablle, a lot of monney is spent on digging reservoirs every year because the reservoirs form sediments in the dry season.19% think that conflict in Belet Hawo county is due to land ownership disagreements and ethnicity when some of the owner's land is displaced to another area to get a better life. The analysis showed different causes of water-related conflicts, as shownn in figure 4.13 below.

Figure 4.13 conflict in water demand

Source: Field data 2021

4.4.3 Challenges the county facing due to water scarcity

When asked about the causes of health problems, 42% percent of the respondents mentioned water scarcity resulted from drought, disease, and lack of health facilities, some of the rural people consumed water of poor quality which has high salt water content, contaminated or expensive. Significant common health issues occur because of water shortages associated with diarrhea, malaria, and fever among children. The findings indicate that 28% of the due to water scarcity, the women's and girls' fetching water long distances and spending more time resulted in the children dropping out the school, and some of them lack money to cover school fees. While most rural people travel to major cities in search of work and business opportunities, few people leave their residences. Some land farmers are now working for a daily income during the wet seasons. According to information collected from respondents during the study, approximately 57 percent of the people moved from their towns to other places where water and agricultural resources were available conditions were good.

Table 4.4 Challenges facing water scarcity

Challenges facing the county due to water scarcity?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Health Problems	42	33.1	33.1	33.1
Absence of Schools	28	22.0	22.0	55.1
Displacements	57	44.9	44.9	11.8
Total	127	100.0	100.0	100.0

Source: Field data 2021.

The price of water had more than doubled, making it unaffordable for the most vulnerable rural areas. The most problem facing the rural people during the dry season, they migrate from near towns while some others remain in their homes. The number of diseases due to water scarcity increased because of the lack of health facilities and poor water supply and sanitation. The government does not allow water supply in vulnerable areas where people lose their lives due to water scarcity.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter describes the research study's summary, conclusions, and recommendations. This study was designed to achieve the study's aims. The chapter also suggests areas for future research to help future researchers make strategic decisions. Based on the objectives, a questionnaire guide was created and utilized to collect the data that was examined, resulting in the research findings, which are summarized and conclusions.

5.2 Summary of the findings

5.2.1 The size of household water demand

The quantity percentage is estimated by measuring per capita water demand and use, as well as the quantity of water required. Water supplies in the areas were scarce, according to respondents, due to insufficiency of water supply caused by poor management, the pressure on people has increased significantly because of rural movement, depletion of water source areas, and weak system maintenance. Daily household water use depends on the size and the number of people who leave their homeland. This is largely due to the rural community's low socioeconomic capabilities, uncertain access to quality, and limited water service. Because of the little rainfall in rural areas, agriculture production is usually relatively low. People who are affected by crop failure rely on food assistance, which is primarily targeted at low-income moms, children, and vulnerable people. According to the report, the majority of females live in rural areas, while their spouses commute to city areas in search of enhanced financial opportunities to supplement their salary. The quantity percentage is estimated by measuring per capita water demand and use, as well as the quantity of water required. Water supplies in the areas were scarce, according to respondents, due to insufficiency of water supply caused by poor management, the pressure on people has increased significantly because of rural movement, depletion of water source areas, and weak system maintenance. People along the river bank depend on farming, while others can’t afford to use irrigation systems to increase productivity throughout the year. According to the World Health Organization (WHO), the most prevalent consequences of insufficient water supply, sanitation, and hygiene are diarrhea, malaria, and typhoid. With limited rainfall and increased resource competition amongst users, agriculture and domestic water demand doubles during the dry season.

Livestock is generally taken to rivers, wells, and reservoirs to drink. There are sometimes disputes between pastoralists during the dry season who bring their animals to the rivers and locals who reside in the area.

demand for household was increases during the shortage of water, the considerable daily walking distance of over 4-5 kilometers traveled to collect water and it takes 2 hours every day to demonstrate the problems in obtaining rainwater and a barrier to meeting the needs of households' water use, as well as a significant amount of valuable time squandered by household members bringing water from a distant source. Because the majority of households rely on empty land water points, there is no discernible difference between the water source and intended function when it comes to meeting their water demands for drinking, washing, cooking, and livestock, among other possibilities.

The environment's degradation will have an impact on the repeated drought in rural communities wherever there is a lack of water, raising the average cost of water per liter/day. This is largely due to the rural community's low socioeconomic capabilities, uncertain access to quality, and limited water service. Because of the little rainfall in rural areas, agriculture production is usually relatively low. People who are affected by crop failure rely on food assistance, which is primarily targeted at low-income moms, children, and vulnerable people. According to the report, the majority of females live in rural areas, while their spouses commute to city areas in search of enhanced financial opportunities to supplement their salary. People along the river bank depend on farming, while others can’t afford to use irrigation systems to increase productivity throughout the year.

5.2.2 The impact of socio-economic factors leading to water scarcity

From the study findings, the Water crisis harms economic opportunity, as well as health, sanitation, and family breakup. The study also found that water scarcity has a significant impact on education, especially among young people. According to UBC research, people are migrating from less unproductive regions to more agriculture ones in seeking of food, pasture for cattle, and economic possibilities. The female sex is most affected by the limited water supply. The survey also revealed that water scarcity has increased; women and young girls often walk long distances and spend a lot of time fetching water and other necessities from their families. Most of the respondents spend an average of 2 hours a day to fetch water, which hinders socio-economic development. The time spent looking for water was to recognized as a significant contributor to their low economic productivity.

There has been a progressive degradation of the county's natural resources thus leading to cases of

water conflict in the county. Water is generally the most significant obstacle as a result of agricultural and rural development, rural poverty is alleviated. The majority of small-scale farmers live in areas with limited natural resources, where a lack of water is a key source of low production as well as increased vulnerability to natural catastrophes and climate change. Several people have left their houses in search of work in some households, while farmers with their properties are now working in the fields of other farmers to supplement their income. Water is generally the most significant obstacle as a result of agricultural and rural development, rural poverty is alleviated. The majority of small-scale farmers live in areas with limited natural resources, where a lack of water is a key source of low production as well as increased vulnerability to natural catastrophes and climate change. The poorest and most vulnerable people and communities are suffering from poverty and famine in rural areas. Water-related poverty occurs when people do not have constant access to water or cannot use it due to a lack of land or market access (Cook and Gichuki 2006).

The impoverished in arid people lack access to financial money, thus they are unable to afford a pump or other necessary equipment. They are characterized by a variety of factors, including erratic rainfall, poor water management, and stressed land and natural resources. The demand perspective recognizes the amount to which water is a limiting element in poverty, as well as the extent to which it may be used to alleviate poverty. The number of persons living in a household and the household income strongest causes of household per capita water use; nevertheless, education, income, and family size are all socioeconomic aspects to consider to influence the amount of water consumed by a household.

5.2.3 The environmental factors causing water scarcity

The third objective of the study indicated the research has established that even though the population of the rural area has grown exponentially, the resource base remains almost constant the resources of the rural communities are fast depleting courtesy of overgrazing and unsustainable economic practice like charcoal burning (Barron, 20014). There has been a progressive degradation of the county's natural resources thus leading to cases of water conflict in the county. Climate factors, as well as human activities, are at interplay in the weather pattern of the county resulting in the low precipitation receive in the rural area. The majority of the rural areas are pastoralists looking to have adequate pasture for their cattle, goats, and camels while the communities are rivals each other, due to scarcity of resources and increased competitiveness for the natural resource. Economic activities such as charcoal burning, among others, were found to be deteriorating the water catchment regions, according to the study. Furthermore, the diversion of several streams and rivers was accompanied by a reduction in the downstream water supply. Poor

agricultural methods, a lack of irrigation infrastructure, and an incorrect groundwater policy were also identified as challenges to water management in the study. Groundwater has not been properly used, according to key informants, and hence there is a need to raise the water table's recharge level. There is also an urgent need to improve crop production, develop drought-tolerant crops, and adopt new farming methods. Various services have been hampered by the perpetual lack of water in the county. As noted in the study, the education sector has been the most affected. In the Red Cross report, children find it hard to attend school in the very dry season. As discussed by Kijne, Barker & Molden (2003), the priority of every resident of the country shifts to finding water whenever the scarcity hits critical points. In the recent drought, it was noted that children of the school-going age skived school since they were focused on finding food or fending themselves.

The rural people traveled long distances during the dry season to get available grazing. Women and children wake up at 5 am during dry seasons and travel for long distances to get water. Continuous water scarcity is a major serious issue. According to the study, people in rural Somalia walked about 2 to 3 kilometers every day looking for water from available sources or natural streams, carrying large containers of 20 to 25 liters on their heads or bags.

Various services have been hampered by the perpetual lack of water in the county. As noted in the study, the education sector has been the most affected. In the Red Cross report, children find it hard to attend school in the very dry season. As discussed by Kijne, Barker & Molden (2003), the priority of every resident of the country shifts to finding water whenever the scarcity hits critical points. In the recent drought, it was noted that children of the school-going age skived school since they were focused on finding food or fending themselves.

The Healthcare sector, just like the education sector experiences a lot of pressures owing to the scarcity of water. Service delivery is generally strained in cases where there is an extreme scarcity of water. Water is needed to run even the most basic of services within education and healthcare institutions. In this regard, it is expected that any slump in the supply of water will further impair the operations of the entities.

5.3 Conclusion

The study's show significant is that the challenges associated with water scarcity were highlighted by the respondents and based on the researcher's own observations. By 2025, 1.8 billion people will live in water-stressed areas, and two-thirds of the world's population would be unable to fulfill their energy, environmental, industrial, residential, and agricultural demands. Water (United Nations, 2007). The management of water resources has become a critical problem in Bangladesh as a result of rising water demand and escalating dispute over alternate uses for it. In Bangladesh, increasing

water shortage is turning into a severe problem as the population grows and utilizes water for a variety of purposes. The results of this study show that drinking water availability and health issues in the study area are significantly threatened by climate change. Climate change effects such as salinity, dry season droughts, and rainy season floods will have a significant influence on both freshwater supplies and clean drinking water. As a result, the great majority of people struggle to access safe drinking water, and more than half of them suffer from various health problems caused by waterborne illnesses. As seen by the limited number of health centers already in operation, safe drinking water policies and medical facilities fall short of need. Households go great distances to fetch clean water. The causes of the water crisis are population increase, low precipitation, overgrazing, and over-exploitation of aquifers. One of the most pressing issues that we face in rural people today is the securing of adequate water for the basis of human survival. The study analysis from Balet Hawo county revealed the problem of water in terms of unimproved water sources, long distance and time taken, and the low per capita household water consumption. Water scarcity remains a great challenge to water sector demand. The people have to get available water quality for enhanced water sources, livelihoods, and sustainable development. Hence, environmental restoration should be vital to any future water management plan. We can quickly improve water availability and quality by increasing the recharge level of the groundwater. Generally, rural people get enough water. Furthermore, the water scarcity also led the farmers to the migration from their homes, negatively affecting the health of children under five and conflict among the pastoralists and farmers due to the shortage of natural resources. Scarcity of water results in poor sanitation, a shortage of safe drinking water, and overpopulation at water sources. This is an ideal combination for infectious disease outbreaks such as cholera, typhoid, and diarrhea. People spend the majority of their time fetching water, causing other economic activities and contributing to poverty.

Construction of water reservoirs has been the most preferred strategy of enhancing water provision in the county according to majority of the respondents thus the devolved government has been sinking boreholes to enhance water distribution in the county. The interviewees also noted that piped water is being used by the devolved government to improve water accessibility as well as encouraging water harvesting to the locals.

5.4 Recommendations

The analysis based on the study, the research needs to make the following recommendation;

1. There is need to change the lifestyle of the inhabitants so that sustainable production practices should be implemented. Instead of the large herds of cattle that end up stressing the available resources, civic education should be promoted to ensure that the wanton environmental degradation in the area is discouraged and sustainable agriculture promoted to enhance productivity as well. The local government has an enormous responsibility to steer the communities in the county towards effective and sustainable use of the available resources to enhance their productivity. This will alter the Balet Hawo County climate and increase precipitation of the area as well as reduce feuds over water resource.
2. Balet Hawo County children drop out of school so as to help parents in search of water. The study recommends the local government to build boreholes near schools.
3. The study also recommends that water reservoirs should be built near wild animal habitats; this would discourage the human-animal conflict over the available water resources.

- households should hold maximum-use water collection containers to gather a large amount of water during the rainy season.
- The institution of government and non-profit organizations should facilitate more water infrastructures and increase the water supply system to generate a wide range of potential benefits for individuals, water users, and people.
- Public awareness of the rural areas can reduce the deforestation of the forest which contribute to the increased rainfall, and recharge of groundwater level and the government should ban anyone who cut the forest.
- Households should endeavor to sanitize the water before consumption and also conserve water to use during the lack of availability of rainfall.
- The children drop out the school to help their parents in search of water, the study recommended the local government build boreholes near homes and schools.
- The local government should establish the capacity skills programmers related to water supply systems and construct watershed management.
- To manage water scarcity in rural areas, the community should also monitor people's activities around conserved water sources to prevent contamination and water waste.

5.5 Recommendation for further studies

This study gives a very general outline on the problem of water in Baled Hawo County and the associated the livelihood that have been brought forth by the scarcity of water in the region. There is a sense that this study lacks a comparative approach comparing the extent to which water scarcity in Baled Hawo County has led to conflicts in the different constituencies in the County. For further research, this study recommends that a specific study is done within the constituencies within Baled Hawo County to establish the extent to which conflicts have been fuelled by water scarcity. To develop an effective policy plan, there is need to develop a specific comprehension of the extent of water scarcity within the constituencies making up Baled Hawo county. This calls for a comprehensive study targeting the specific constituencies.

i. The reasons for the water crisis in the rural areas and the correlation between water scarcity and conflict rising.
ii. Water scarcity has an impact on female education dropout rates, family breakdown, household conflict, and women's health.
iii. Improvement of the quality and quantity of water.
iv. A comparison between men's and women's access to information water resources.

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