


PERCEPTIONAL DIFFERENCES ON DROUGHT OCCURRENCE AND RESILIENCE BUILDING MECHANISMS IN KEBRI DEHAR DISTRICT, SOMALI REGION OF ETHIOPIA

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 07 April 2023</p> <p>Accepted 04 July 2023</p>	<p>Purpose: The aim of the research was to analyze the drought hazard occurrence, perceptual differences among residents to drought hazard occurrence, and explore the resilience mechanisms at household, community level, and institutional level to recover from drought hazards</p>
<p>Keywords:</p> <p>ANOVA; Drought; Drought Management; Drought Hazards; Perception; Resilience Mechanism.</p>	<p>Theoretical framework: The research dealt with the theoretical aspects of how hazards occurrence can be observed through the perceptual differences of the residents in a particular area. Adoption of short- and long-term drought resilience mechanisms is inevitable to recover from drought hazards.</p>
	<p>Design/methodology/approach: This study is based on exploratory research design. Four ‘kebeles’ were selected considering drought classifications and 200 respondents were chosen. Descriptive statistics, Timeline Approach and ANOVA were used to analyze the data collected.</p> <p>Findings: Majority of respondents know about drought hazard occurrence, causes at their level, and experienced the effects of drought. There are significant perceptual differences among respondents across educational and marital status, and monthly income.</p> <p>Research, Practical & Social implications: Household and community participation is essential for adopting drought resilience mechanisms with the support of governmental and non-governmental agencies.</p> <p>Originality/value: This Study focused on drought hazard occurrence and resilience mechanisms at household and community level to recover drought hazards. The originality / value of the study lies with perceptual differences on drought hazards occurrence using the Timeline approach and ANOVA. The findings of this study would contribute to design and implement effective drought resilience mechanisms.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i7.2360</p>

DIFERENÇAS DE PERCEPÇÃO SOBRE A OCORRÊNCIA DE SECAS E MECANISMOS DE CONSTRUÇÃO DE RESILIÊNCIA NO DISTRITO DE KEBRI DEHAR, REGIÃO SOMALI DA ETIÓPIA

RESUMO

Objetivo: o objetivo da pesquisa foi analisar a ocorrência do risco de seca, as diferenças de percepção entre os residentes em relação à ocorrência do risco de seca e explorar os mecanismos de resiliência em nível doméstico, comunitário e institucional para se recuperar dos riscos de seca

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Estrutura teórica: A pesquisa tratou dos aspectos teóricos de como a ocorrência de perigos pode ser observada por meio das diferenças de percepção dos residentes em uma determinada área. A adoção de mecanismos de resiliência à seca de curto e longo prazo é inevitável para a recuperação dos riscos de seca.

Projeto/metodologia/abordagem: Este estudo baseia-se em um projeto de pesquisa exploratória. Quatro "kebeles" foram selecionados considerando as classificações de seca e 200 entrevistados foram escolhidos. Estatísticas descritivas, abordagem de linha do tempo e ANOVA foram usadas para analisar os dados coletados.

Resultados: A maioria dos entrevistados sabe sobre a ocorrência do risco de seca, as causas em seu nível e experimentou os efeitos da seca. Há diferenças significativas de percepção entre os entrevistados em relação à escolaridade, ao estado civil e à renda mensal.

Implicações sociais, práticas e de pesquisa: A participação das famílias e da comunidade é essencial para a adoção de mecanismos de resistência à seca com o apoio de agências governamentais e não governamentais.

Originalidade/valor: Este estudo concentrou-se na ocorrência de riscos de seca e nos mecanismos de resiliência em nível familiar e comunitário para recuperar os riscos de seca. A originalidade/valor do estudo está nas diferenças de percepção sobre a ocorrência de riscos de seca usando a abordagem de linha do tempo e ANOVA. As descobertas deste estudo contribuiriam para projetar e implementar mecanismos eficazes de resistência à seca.

Palavras-chave: ANOVA, Seca, Gerenciamento de Secas, Riscos de Seca, Percepção, Mecanismo de Resiliência.

DIFERENCIAS EN LAS PERCEPCIONES DE LA OCURRENCIA DE SEQUÍAS Y MECANISMOS DE CONSTRUCCIÓN DE RESILIENCIA EN EL DISTRITO DE KEBRI DEHAR, REGIÓN SOMALÍ DE ETIOPÍA

RESUMEN

Propósito: El propósito de la investigación era analizar la ocurrencia del riesgo de sequía, las diferencias de percepción entre los residentes con respecto a la ocurrencia del riesgo de sequía y explorar los mecanismos de creación de resiliencia a nivel familiar, comunitario e institucional para recuperarse de los riesgos de sequía.

Marco teórico: La investigación abordó los aspectos teóricos de cómo puede observarse la aparición de riesgos a través de las diferencias de percepción de los residentes en una zona determinada. La adopción de mecanismos de resiliencia a la sequía a corto y largo plazo es inevitable para recuperarse de los riesgos de sequía.

Diseño/metodología/enfoque: Este estudio se basa en un diseño de investigación exploratorio. Se seleccionaron cuatro "kebeles" teniendo en cuenta las clasificaciones de sequía y se eligieron 200 encuestados. Para analizar los datos recogidos se utilizaron estadísticas descriptivas, el enfoque cronológico y el ANOVA.

Resultados: La mayoría de los encuestados conocen la ocurrencia del riesgo de sequía, las causas a su nivel y experimentaron los efectos de la sequía. Existen diferencias significativas en la percepción entre los encuestados en relación con la educación, el estado civil y los ingresos mensuales.

Implicaciones sociales, prácticas y para la investigación: La participación de los hogares y de la comunidad es esencial para la adopción de mecanismos de resistencia a la sequía con el apoyo de organismos gubernamentales y no gubernamentales.

Originalidad/valor: Este estudio se centró en la aparición de riesgos de sequía y en los mecanismos de resiliencia a nivel familiar y comunitario para recuperarse de los riesgos de sequía. La originalidad/valor del estudio radica en las diferencias en la percepción sobre la ocurrencia de los peligros de sequía utilizando el enfoque de línea de tiempo y ANOVA. Las conclusiones de este estudio contribuirán a diseñar y aplicar mecanismos eficaces de resiliencia a la sequía.

Palabras clave: ANOVA, Sequía, Gestión de la Sequía, Riesgos de Sequía, Percepción, Mecanismo de Resiliencia.

INTRODUCTION

Dryness that can be found almost anywhere in the world is known as drought, which is an ongoing natural disaster caused by lack of precipitation that results in a water shortage. Drought has a serious impact on health, agriculture, economies, energy and the environment (Drought, 2018). Because of rising water demand and the threat of climate change, global

drought scenarios have received a lot of attention in recent years (Mishra & Singh, 2010). Droughts affect an estimated 55 million people worldwide each year, and they are the most serious threat to crops and livestock and drought could force 700 million people to flee their homes by 2030 (Drought, 2018).

Climate change is affecting food production, making it difficult to feed population. (Azevedob & Fernandes, 2020). For example, in many African countries, climate change has led to droughts and erratic weather patterns that have destroyed crops, causing food shortages and famine. This has resulted in increased migration and conflict over scarce resources. Extreme heat and drought also wreaked havoc on parts of Africa in 2022. The Horn of Africa is experiencing the longest and most severe drought as of the end of 2022. Drought and high food prices have severely limited many people's ability to grow crops, raise livestock, and buy food (Worst Drought on Record Parches Horn of Africa, 2022). The worst drought in four decades has exacerbated the situation, affecting 24.1 million people, including 12.6 million children in Ethiopia. Anticipatory cash transfers and early warning information are being provided ahead of the drought (Anticipatory and Results, 2022). Drought preparedness plans are part of the prevention of drought-related risks and also Creating and strengthening a National Drought Technical Advisory Committee (NDTAC), making the drought response participatory by involving the local community, Building capacity, Infrastructure creation, policy revision, Management and development of natural resources , the adoption of new technologies to deal with the effects of drought and enhances community resilience (Mera, 2018).

Drought has three types of effects: economic, environmental, and Social (Mekonnen & Gokcekus, 2020). Agricultural, Energy, Financial, and Transportation are all economic categories. Animal/Plant, wildlife habitat, Wetland, and Water Quality, landscape quality and loss of biodiversity are all part of the Environmental Category. Public Safety, reduced quality of life, Nutrition, Stress, and Health are examples of Social Categories (Knutson et al., 1998). Drought has had a wide-ranging impact on people, the environment, water resources, and agriculture in East Africa (Gebremeskel et al., 2019).

The lack of rainfall, human activities, drying out of surface water flow, climate change, global warming, and a deficiency of knowledge on adaptive farming techniques are all contributing factors to drought conditions in Ethiopia (Mekonnen & Gokcekus, 2020). Non-Governmental Organization and Public-private partnerships have aided in implementing integrated, participatory watershed management tools, greatly restoring hope for their

communities. Such interventions include enacting resource management bylaws, soil erosion control, water harvesting, and drip irrigation. These measures have notably improved food production, regenerated biodiversity of the area, and ultimately enhanced water security (GWPEA, 2016). There is more and more evidence that financial Index-based insurance is one example of a service. This is an important part of building resilience. These services must be available to people who are the most vulnerable (Roop et al., 2016).

Pastoralists have different strategies for dealing with the loss of their livestock-based livelihoods, such as selling, migrating, and reducing household expenditure, taking paid labour, and relying on traditional social support. Additionally, some young men migrate to surrounding cities or Kenya to work and send money home. A few stakeholders have attempted to help the resilience of these pastoralist communities in response to droughts. These efforts have had a range of success rates, such as focusing on herders' rehabilitation and livelihoods, nutrition, sanitation/water services, HIV prevention/treatment, basic education and child development services, natural resource management/education (Roop et al., 2016).

When it comes to resilience mechanisms at the household level, it can be categorized into both financial and non-financial activities. Financial activities can include borrowing from formal institutions or informal groups; insurance; saving with formal institutions or capital market instruments; receiving transfers from mutual-aid networks or within a community. Non-financial activities might include depending on government subsidies/social assistance; investing in tangible assets; selling physical assets; taking advantage of employment opportunities/production options (Shibia, 2020).

Kebri Dehar District, located in the Somali Region of Ethiopia, has a long history of experiencing droughts. These droughts have had a significant impact on the local population, particularly those who rely on agriculture and livestock for their livelihoods. In recent years, the frequency and severity of droughts in the region have increased, exacerbating the already difficult living conditions for the local communities. To address the challenges posed by drought in Kebri Dehar District, various resilience building mechanisms have been implemented. The governmental policies and interventions aimed at enhancing resilience against future droughts in this region. However, there are still challenges in the implementation and effectiveness of these interventions, such as limited resources and lack of community participation. As a result, there has been a growing need to understand the perceptual differences between drought occurrence and resilience. The research objectives of the study are.

- To assess the knowledge, causes and occurrence of drought in Kebri Dehar District.
- To analyze the perceptual differences among residents to drought hazard occurrence.
- To explore the resilience mechanisms at household, community level, and institutional level to recover drought hazards in the study area.

This Study focused on assessing drought hazard occurrence in Kebri Dehar District and explore the resilience mechanisms at household and community level to recover drought hazards. More specifically, this study presented evidence and data of important changes that have occurred over different timeframes, perceptual differences among respondents, and explored drought- resilience mechanisms to recover drought hazards as well.

MATERIALS AND METHOD

This study is based on exploratory research design. The study area is Kebri Dehar District, Somali region of Ethiopia, which is one among the most drought affected areas and needs proper interventions through appropriate resilience mechanism to reduce/mitigate the severity of the drought. Based on this reason and accessibility of the area by the researchers the Kebri Dehar District was selected for the research study. It is understood through discussions with the officials of the District Disaster Risk Management Bureau (DRMB), Meteorological Station and by referring to the necessary official documents, the drought classifications are recorded as high and medium. Based on stratified random sampling two ‘kebeles’ were selected from each drought classification. Accordingly, four ‘kebeles’ were selected by giving due representation to each drought classification.

The study respondents were chosen from the select four ‘kebeles’ randomly. By employing Yamane (1967) sampling formula, the sample size was determined. The population of the select four ‘kebeles’ is 21,932 and the sample was arrived by using the following formula.

$$\begin{aligned} \text{Yamane's Formula } (n) &= N/(1+N*(e)^2) \\ &= 21932/((1+21932)(0.05)^2) \\ &= 399.98 \text{ round up to } 400. \end{aligned}$$

The arrived sample size was 400 which is not manageable due to time paucity and budget constraints. So, the researchers considered 50 percent of 400 i.e., 200 as the sample size as for study respondents. Form the selected four ‘kebeles’ the actual sample size was

determined by using proportion to population size. The sample 'kebeles' and respondents for the study is depicted in the following table 1.

Table 1 - Sample 'kebeles' and Respondents

Kebele Name	Drought classification	Total Population	Proportion to Population size (%)	Sample Respondents
Dalaad	Medium	10,626	48.50	97
El-bakol	Medium	1,700	07.50	15
Mara'to	High	8,406	38.50	77
Qodaxley	High	1,200	05.50	11
Total		21,932	100.00	200

Source: prepared by authors, 2023.

In addition to the respondents, Key Informant Interviews(KIIs) comprising the head from District Disaster Risk Management Bureau (1), The head from Kebri Dehar Meteorological station (1), Head/Expert from respective selected four kebele offices (4), and community leaders from select 'kebeles' (4) totaling 10 key informants. Moreover, in order to triangulate four Focus Group Discussions were also conducted. Those groups were one each from selected 'kebeles'.

Data Collection Method

Primary data was collected from respondents of selected 'kebeles' in order to elicit information regarding the issues addressed by administering semi-structured interview schedule. KIIs were guided using checklist and information was collected through face-to-face interview. Focus Group Discussions (FGDs) were conducted on the issues related to nature of drought in terms of severity using checklist. Secondary data were obtained from District Disaster Risk Management Bureau (DRMB), Kebele offices, Kebri Dehar Meteorological station, published and unpublished reports. Consultations were also conducted with key stakeholders and local community representatives.

Descriptive Statistics

The profile of the respondents such as demographic and socio-economic characteristics is inevitable to any study and helps in depicting a complete picture of the respondents. In this section the demographic, social and economic profile of the sample respondents are presented and discussed. Variables such as gender, age, educational status, marital status, household size, occupation, monthly income, and social participation of the respondents were considered for analysis and results are presented in Table 2 hereunder.

Table 2 - Demographic, Social and Economic Characteristics of Respondents

Response N = 200		Frequency	Percent
Characteristics of Respondents			
Gender	Female	104	52.0
	Male	96	48.0
Age category <i>Mean Age (37.8050)</i>	Young (upto 35)	89	44.5
	Middle (36 - 60)	99	49.5
	Old (61 and above)	12	6.0
Educational Status	Illiterate	147	73.5
	Primary	34	17.0
	High school	9	4.5
	Higher Secondary	6	3.0
	Certificate/ TVET	2	1.0
	First Degree	2	1.0
Marital Status	Single	15	7.5
	Married	165	82.5
	Divorced	12	6.0
	Widowed	8	4.0
Household Size <i>Mean HH Size (7.5800)</i>	Small	24	12.0
	Medium	125	62.5
	Large	51	25.5
	Total	200	100.0
Occupation	Agricultural	103	51.5
	Labour	51	25.5
	Government Employee	13	6.5
	Others	33	16.5
Monthly Income	<1000	137	68.5
	1001-2500	53	26.5
	2501-5000	7	3.5
	5001-10000	3	1.5
Social Participation	SHGs	82	41.0
	Cooperative	21	10.5
	Women Association	4	2.0
	Youth Association/Club	12	6.0
	Professional Association	14	7.0
	Others	67	33.5

Source: prepared by authors, 2023.

According to the table 2 the descriptive study results indicate that 52% of respondents are female. The majority (49.5 percent) of respondents are of middle age (36 to 60 years), followed by 44.5 percent of respondents of young age. The average respondent age is 37.8 years. As for educational level, 73.5 percent of respondents are illiterate, followed by 17 percent who have only completed primary school. 82.5 percent of respondents are married, and 62.5 percent of respondents have a medium-sized home. 51.5 percent of respondents are agriculturalists, while the remaining 25.5 percent are laborers. The majority of respondents (68.5%) earn less than 1000 birr per month. 41 percent of respondents are members of SHGs, followed by 10.5 percent are members of cooperatives.

Data Analysis

Data analysis was done using both quantitative and qualitative methods (Perlin, et al., 2022), including descriptive statistics such as frequency, percentage, mean, standard deviation, timeline, and ANOVA. ANOVA is a technique used to test the differences in perception among respondents by way of two hypotheses: the null hypothesis (H0), which assumes that “there is no effect” or “there is no change”; and the alternate hypothesis (H1), which is adopted if there is strong evidence against the null hypothesis (H0). If the null hypothesis is rejected, it means the data is statistically significant. However, if it fails to be rejected, there isn't enough evidence to do so (Campolo et al., 2003).

The formula for a one-way ANOVA, which is the most basic form of ANOVA, is:

$$F = \frac{\text{MS between}}{\text{MS within}}$$

$$\text{MS between} = \frac{\text{Sum of Squared Deviations between group means}}{\text{number of groups} - 1}$$

$$\text{MS within} = \frac{\text{Sum of Squared Deviations within groups}}{\text{total number of observations} - \text{number of groups}}$$

The F statistics is represented in equation form

$$F = \frac{\sum n_i (\bar{x}_i - \bar{x})^2 / (k - 1)}{\sum \sum (x - \bar{x}_i)^2 / (N - K)}$$

In the F test statistic, n_i is the sample size \bar{x}_i is the sample mean of i^{th} group n_i is the sample size, K denote no of independent group, (in this study $k=2$), and \bar{x} is the overall mean and $N=200$ i.e. total number of observations in this study

The F statistics is the ratio between the variation between group and variation within group. If the null hypothesis is true, then F statistics is zero that's means the drought occurrence perception among the respondents are same. The hypotheses framed for the present study for ANOVA are follows:

H₀: there is no statistical difference between drought occurrence perception among respondents.

H₁: there is a statistical difference between drought occurrence perception among respondents.

In addition to the results of statistical treatment, the results out of key Informants Interviews, FGD, and observation were given by narrations and were supplemented to the survey results.

RESULTS AND DISCUSSION

In this section an attempt has been made to describe what do respondents know about drought, causes of drought, and time line result of drought occurrence in Kebri Dehar district. The aspects of water levels in lakes and reservoirs fall, lack of rainfall, Decline water reservoirs, Surface water unavailability, Shortage of water, Dry weather, Plants die; climate change, strong wind, shortage of rain, humidity, high temperature under causes are considered for analysis and results are presented in the following tables and interpretations are given hereunder.

Table 3 - Knowledge about Drought (Multiple response)

Items	Response	Frequency	Percent
Water levels in lakes and Reservoirs fall		176	88.0
Lack of rainfall		192	96.0
Decline water reservoirs		180	90.0
Surface water unavailability		177	88.5
Shortage of water		175	87.5
Dry weather		175	87.5
Plants die		175	87.5

Source: prepared by authors, 2023.

According to the table 3, more than 80% of responses for water levels in lakes and reservoirs fall, Lack of Rainfall, Decline Water Reservoirs, Surface Water Unavailability, Shortage of Water, Dry Weather, Plants die, and Prolonged Period Below Normal Rainfall, indicating that respondents know and are aware of drought in their 'kebeles'. Majority of (192 – 96%) respondents reported that there has been lack of rainfall in their 'kebeles'.

Table 4 - Causes of Drought (Multiple response)

Items	Response	Frequency	Percent
Climate change		182	91.0
Strong Wind		179	89.5
Shortage of Rain		180	90.0
Humidity		178	89.0
High temperature		173	86.5

Source: prepared by authors, 2023.

According to the table 4, climate change, strong winds, a lack of precipitation, high humidity, and high temperatures are the leading causes of drought in the selected 'kebeles', as all of these factors received more than 85 percent of the responses as reported by the respondents.

Drought Occurrence in Kebri Dehar District

Drought occurrence in Kebri Dehar District is presented and discussed in this section. The Time-line of drought occurrence, Drought Occurrence and Long-Term Changes in terms of direction of changes, noticing period, and impact on livelihoods are analyzed. The results are presented in the following tables and interpretations are given hereunder.

Timeline Approach: The timeline method is a useful collaborative tool that helps to examine the past incidents, by arranging pivotal moments in chronological order. By participating in this exercise, stakeholders can think over the innovation process, recognize patterns and discuss crucial successes and issues. Timelines illustrate people's own recollection of their journey – a chronology of noteworthy events or alterations over time, with close or exact dates whenever possible. They help in creating an individual or collective history and recognizing significant points at which their natural resources or access to them shifted. These timelines may contain broad trends with approximate dates (e.g. fish stocks decreased from 2007-2010) or particular events (e.g. 2013's drought year, arrests on 14 November 2014 and a series of meetings with government officers and investors). It is important to note that some 'events' may occur over a number of years, whereas others may correspond to a single year or even a month or day.

This activity requires a long piece of paper; it does not need to be thick, but it must be long; several sheets of flipchart paper joined end-to-end also work well. To create a timeline, start by determining the start and end dates on paper and writing the intervening years at evenly spaced intervals along its length. Then, invite participants in a group discussion to recall any significant changes or events; record these on index cards and place them as precisely as possible on timeline. In this research the researchers had discussions and developed the timeline on drought occurrence for the recent seven years. The information on Drought events, duration, severity and impact of drought were elicited and presented in table 5.

Apart from analyzing drought occurrence by respondents' response during discussion among KIIs and experts from meteorological station and FGDs a Timeline Approach was adopted in order to elicit information on drought occurrence over the recent 7 years' period in

Kebri Dehar District. The timeline results in Kebri Dehar are given to understand the trend in drought over the recent 7 years' period.

Table 5 - Timeline Results (from selected 'kebeles' of Kebri Dehar District)

Year	Drought Event	Duration	Severity	Impact
2016	Abaarta safmarka/ epidemic drought	2016-2017	High	Livestock diseases, High livestock mortality, a lot IDPs, Human diseases & Human mortality
2017				
2018	Intermittent Drought	2018-2019	Medium	Moderately dry SPI, water shortage
2019				
2020	Abaartii raagtay/ prolonged drought	Mid 2020 up to 2022	High	High livestock mortality, a lot IDP
2021				
2022				

Source: prepared by authors, 2023.

Drought Occurrence in Kebri Dehar District: Long Term Changes, Direction of Changes, Noticing Period, and Impact on livelihoods

The responses of the residents of Kebri dehar district on long term changes, direction of changes, noticing period, and impact on livelihoods were gathered, processed and presented in the following table.

Table 6 - Drought Occurrence: Long Term Changes Direction of Changes, Noticing Period, and Impact on livelihoods

Have you observed/ noticed any long-term changes in the following phenomena over the years in your Kebele? Yes (67) / No (133)					
What is their direction of change? (N = 67)		In which period did you start noticing the stated phenomena? (N = 67)		What is the impact of this phenomenon on Livelihoods? (N = 67)	
Precipitation					
<i>The percentage is shown in brackets.</i>					
Decreased	20 (33.3)	Past 2 years	25 (41.7)	No impact	13 (21.7)
Increased	17(28.3)	Past 5 years	19 (31.7)	Low impact	7 (11.7)
Fluctuated	23 (38.3)	Past 10 years	20 (33.3)	Medium impact	4 (6.7)
Unchanged	7 (11.7)	Past 20 years	3 (5.0)	High impact	43 (71.7)
Temperature					
Decreased	8 (13.3)	Past 2 years	21 (35)	No impact	17 (28.3)
Increased	34 (56.7)	Past 5 years	23 (38.3)	Low impact	9 (15)
Fluctuated	19 (31.7)	Past 10 years	21 (35)	Medium impact	7 (11.7)
Unchanged	6 (10)	Past 20 years	2 (3.3)	High impact	34 (56.7)
Drought					
Decreased	7 (11.7)	Past 2 years	24 (40)	No impact	14 (23.3)
Increased	33 (55)	Past 5 years	21 (35)	Low impact	7 (11.7)
Fluctuated	23 (38.3)	Past 10 years	17 (28.3)	Medium impact	9 (15)
Unchanged	4 (6.7)	Past 20 years	5 (3.3)	High impact	37 (61.7)
Long period of dry season					
Decreased	10 (16.7)	Past 2 years	19 (31.7)	No impact	8 (13.3)
Increased	34 (56.7)	Past 5 years	23 (38.3)	Low impact	12 (20)
Fluctuated	14 (23.3)	Past 10 years	20 (33.3)	Medium impact	11 (18.3)

Unchanged	9 (15)	Past 20 years	5 (8.3)	High impact	36 (60)
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Source: prepared by authors, 2023.

The above Table 6 reveals that majority of respondents (133 out of 200) are either unaware of, or have not noticed, long-term changes in Precipitation, Temperature, Drought, and Dry Season in their 'kebeles'. The direction of rainfall (precipitation) is mixed, with 33.3 percent responded as decreased, 28.3 percent responded as increased, and 38.3 percent responded as fluctuated. More than 70% of respondents began to detect the direction of rainfall between two to five years. Rainfall had a significant impact on 71.7 percent of respondents' livelihoods.

The temperature of the selected 'kebeles' has been increasing during recent years, as stated by 56.7 percent of respondents, while temperature fluctuation is indicated by 31.7 percent of respondents. Temperature has had a significant impact on 56.7 percent of respondents' livelihoods. From 2 to 5 years, more than 70% of respondents began to perceive the direction of temperature change. Drought has been reported by 55 percent of respondents, with 38.3 percent reported that it has been varying in their 'kebeles' and has severely harmed their livelihoods. The dry season has risen in the selected 'kebeles', affecting their livelihoods, as indicated by 56.7 and 60 percent of respondents, respectively.

Effects of Drought in Kebri Dehar District

The effects of drought occurrence in Kebri Dehar district is analyzed and depicted in the following table.

Table 7 - Effects of Drought

Questions	Response (N = 200)			
	Yes	No	Mean	Stdv
1. Have you experienced drought hazard occurrence?	187 (93.5)	13 (6.5)	1.93350	.247114
2. Did you have to move from your household village because of drought?	113 (56.5)	87 (43.5)	1.5650	.49700
3. Did any member of your family migrate during the drought period?	113 (56.5)	87 (43.5)	1.5650	.49700
4. Did you have access to clean water for domestic purposes during these periods?	102 (51.0)	98 (49.0)	1.5100	.50115
5. Did you face any water shortage problem during drought period	108 (54.0)	92 (46.0)	1.5400	.49965
6. Did you have access to enough foods during drought?	66 (33.0)	134 (67.0)	1.6700	.47139
7. Did any member of your family fall sick during the drought period?	134 (67.0)	66 (33.0)	1.6700	.47139
8. Was the sickness due to malnutrition?	126 (63.0)	74 (37.0)	1.6300	.48402

9. Did you have access to quality health care?	87 (43.5)	113 (56.5)	1.4350	.49700
10. Did any member of your family (schooling) change school during these periods?	139 (69.5)	61 (30.5)	1.6950	.46156
11. Did any member of your family drop out of school as result of drought effect?	45 (22.5)	155 (77.5)	1.7750	.41863

Source: prepared by authors, 2023.

According to the above table 7, the results show that 93.5 percent of respondents had encountered drought hazards. Because of the drought, 56.5 percent of respondents have relocated from their household village. During the drought, 56.5 percent of respondents' families migrated. During drought seasons, just 51 percent of respondents had access to clean water for home use, while 54 percent suffered a water shortage problem. During the drought, 33 percent of respondents have access to enough food. During the drought season, 67 percent of respondents' families become sick, while 63 percent become sick as a result of malnutrition. During the drought, just 43.5 percent of respondents had access to quality health care. During these time periods, 69.5 percent of respondents changed schools of their children. As a result of the drought, 22.5 percent of respondents' family children had dropped out of school.

ANOVA for Difference of Means Across Demographic, Social and Economic Variables of the Respondents

The hypotheses on the perceptual difference on drought occurrence across demographic, social, and economic variables of respondents are tested through ANOVA. The result for ANOVA is given in the below Table 8.

Table 8 - ANOVA for difference of means across demographic, social and economic variables of the respondents

Variables	Variations	Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	568.808	1	568.808	3.287	.071
	Within Groups	34262.587	198	173.043		
	Total	34831.395	199			
Educational Status	Between Groups	84.500	1	84.500	162.437	.000
	Within Groups	103.000	198	.520		
	Total	187.500	199			
Marital status	Between Groups	3.568	1	3.568	12.943	.000
	Within Groups	54.587	198	.276		
	Total	58.155	199			
Household size	Between Groups	1.373	1	1.373	.152	.697
	Within Groups	1783.347	198	9.007		
	Total	1784.720	199			
Occupation	Between Groups	1.594	1	1.594	.346	.557
	Within Groups	911.281	198	4.602		

	Total	912.875	199			
Monthly income (in Birr)	Between Groups	10.712	1	10.712	31.004	.000
	Within Groups	68.408	198	.345		
	Total	79.120	199			
Social participation	Between Groups	12.075	1	12.075	2.410	.122
	Within Groups	992.245	198	5.011		
	Total	1004.320	199			

Source: prepared by authors, 2023.

It can be observed from table 8 that p-value for difference of means for drought occurrence construct across age was higher than 0.05. This implied that there was no significant perceptual difference towards drought occurrence across age. The drought hazard affects individuals irrespective of their age is not associated with ageing. It could be the underlying reason behind no perceptual difference towards drought occurrence across age.

The significance value for the F-statistics is 0.000 which is less than 0.05 across educational status, marital status and monthly income of the respondents. This implied that there is a significant difference in perception towards drought occurrence across educational status, marital status and monthly income groups of the respondents. As a result, the finding suggested that there is significant difference found in the mean scores of drought occurrence with respect to educational status and income between and within groups due to the reason that the observation, experience, and capacity to adapt depends on the educational background and income level. It can be inferred that there is difference married and other category among marital status due to being more responsible with family.

It can be observed from table 8 that p-value for difference of means for drought occurrence construct across household size (.697), occupation (.557) and social participation (.122) was higher than 0.05 percent level. This implied that there is no significant perceptual difference towards drought occurrence across household size, occupation and social participation of the respondents. The drought hazard affects individuals irrespective of their household size, occupation and social participation, which has been seen as a common phenomenon. It could be the underlying reason behind no perceptual difference towards drought occurrence across the aforementioned variables.

FGD Results

Four focus group discussions (FGDs) were held at the four chosen 'kebeles' in Kebri Dehar District to ensure attendance levels of 10-15 participants per FGD. The following summaries are based on the results of the FGDs:

- The FGD participants reported that drought has been a common phenomenon occurring for the past long years. It has its own effect on water level in reservoirs, wells and other water sources. They revealed that all types of drought hazards have been occurring in the district.
- As institutional arrangements and infrastructure the meteorological station at Kebri Dehar, disaster preparedness and prevention bureau and some NGOs are working to minimize the effect of drought in the district.
- Few attempts have been made to empower Local Authorities to combat emergencies, drought, and disasters on a local level. Most of the FGD participants expressed that there is an absence of a concrete connection and synchronization between local decision-making committees and departments responsible. This poses a true test to quick and effective early warning/alerting.
- Though there are drought management plans in place, their execution is unsatisfactory and uncoordinated. Drought management/coordination committees, mainly comprising of government ministries such as agriculture, health, and NGOs are mainly organized to control targeting, aid distribution, and vulnerability evaluation.
- Furthermore, the migration of human resources to other areas within and outside of the country has weakened the ability of the community to actively partake during drought periods.
- The participants were posed with the question of recognizing major hazards affecting their communities; drought was mentioned as being the most common and greatest danger.

The household level drought adaptation and resilience building practices were identified by administering a list of drought adaptation and resilience mechanisms practiced at the household level among the FGD participants. The results out of FGDs conducted on the issue are highlighted with symbols \checkmark and **X** whether they adapted drought resilience mechanism at their household level or not.

Table 9 - Drought Adaptation and Resilience Building – Household Level

Known drought resilience mechanism	FGD1	FGD2	FGD3	FGD4
Short-term				
Food Assistance	\checkmark	X	\checkmark	X
Migrate to another workplace	\checkmark	\checkmark	\checkmark	\checkmark
Traditional practices/rituals	\checkmark	\checkmark	\checkmark	\checkmark
Sale of livestock before they die	\checkmark	\checkmark	\checkmark	\checkmark
Reduce their food rations	X	\checkmark	X	\checkmark
Support from Agencies	\checkmark	\checkmark	\checkmark	\checkmark

Long-term				
Home gardens	X	X	X	X
Group Savings	X	√	X	√
Livestock rearing	X	√	X	√
Crop diversification	√	√	√	√
Enough food stock reserves	√	X	√	X
Conservation Agriculture system	√	√	√	√
Water harvest/water sheds /reservoirs	X	X	X	X
Seeking for alternative employment	√	√	√	√
Wastewater usage for gardens		X	X	X
Establishing small businesses	√	X	√	X
Awareness creation/training	X	X	X	X

Source: prepared by authors, 2023.

In order to ensure food security, people may rely on external sources of food aid, migrate to pursue employment elsewhere, or practice traditional rituals that involve selling livestock before they succumb to death. As a last resort, some may even reduce their food rations. Thankfully, support from governmental and non-governmental agencies is available to those who require it.

KIIs Results

The key informant interviews were also conducted among key informants comprising the head from District Disaster Risk Management Bureau (1), The head from Kebri Dehar Meteorological station (1), Head/Expert from respective selected four kebele offices (4), and community leaders from select 'kebeles' (4) totaling 10 key informants. The views forwarded by the KIIs are compiled hereunder as results:

- They agreed that all types of droughts did occur.
- They observed the changes in temperature over the period of 20 years; and changes in precipitation(rainfall) over the period of last 20 years.
- Key informants noted that the weather in the district hasn't been great lately. Most agricultural and livestock production is reliant on rainfall, making it vulnerable to dry spells and less rainfall.
- They opined that there has been water related issues, food related issues; livestock related issues; and employment related issues which resulted to migration to other places during drought periods.

At the community and institutional level drought adaptation and resilience building practices were also identified by administering a list of drought adaptation and resilience mechanisms practiced at the household level among the Key Informants. The results out of KIIs

conducted on the issue are highlighted with symbols \checkmark and **X** whether they adapted drought resilience mechanism at community and institutional levels or not.

Table 10 - Drought Adaptation & Resilience Building: Community & Institutional Level

Drought resilience mechanism	Community Level (N = 4)	Institutional Level (N = 6)
Short-term		
Food Assistance	\checkmark	X
Helped to migrate other workplaces	\checkmark	\checkmark
Encouraged traditional practices/rituals	\checkmark	\checkmark
livestock sale before they die	X	\checkmark
Support from Agencies	\checkmark	\checkmark
Long-term		
Advised Home gardens	X	\checkmark
Established Group Savings	X	\checkmark
Livestock rearing	X	\checkmark
Crop diversification strategies	\checkmark	\checkmark
Food stocks (reserves)	\checkmark	X
Conservation Agriculture system	\checkmark	\checkmark
Water harvest/water sheds /reservoirs	X	\checkmark
Alternative employment schemes	\checkmark	\checkmark
Wastewater usage for gardens	X	\checkmark
Establishing small businesses	X	\checkmark
Awareness creation/training	X	\checkmark

Source: Source: prepared by authors, 2023 from KIIs conducted in selected 'kebeles' and Departments concerned

The table 10, clearly presents the status of drought adaptation and resilience mechanisms at community and institutional level in Kebri Dehar District. The symbol \checkmark reveals that the participants adapted resilience mechanisms as given in the table whereas **X** reveals that they did not adapt such stipulated drought resilience mechanisms. The results reveal that though the initiation and measures taken by the institutional set up in the form of resilience mechanisms the reach of those mechanisms and implementation of schemes and programs related to minimize drought occurrence is not as expected in the district.

CONCLUSION

This study assessed the drought occurrence, perceptual differences and resilience building mechanisms in Kebri Dehar District, Somali Region of Ethiopia at household and community level to recover drought hazards. The study result indicated that drought is persistent in the Kebri Dehar district. Majority of respondents know about drought hazard occurrence, but they were either unaware of, or have not noticed, long-term changes in Precipitation, Temperature, Drought, and Dry Season in their 'kebeles'. The respondents know the causes at their level and experienced the effects of drought in the study area. There are

significant perceptual differences among respondents across educational and marital status, and monthly income. Though Disaster Risk Management Bureau is playing a major role in terms of drought condition monitoring and controlling along with bureaus like the metrological station, the Agricultural Bureau, Water Board, NGOs and other agencies, the household and community level active participation is needed for adopting some sort of drought resilience mechanism.

This research study provides a comprehensive understanding of the perceptions and experiences of households in the Kebri Dehar District and accounts for the demographic and social factors that influence perceptions and resilience building mechanisms in the Kebri Dehar District of the Somali Region, which could limit the applicability of the findings to other regions or communities. In the future, research may be conducted in other districts of somali regions to compare and contrast the findings and gain a more comprehensive understanding of the factors that influence perceptions and resilience building mechanisms in different contexts.

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