

Assessing the Influence of Drought and Coping Strategy Focus Pastoralist: The Case of Melka Sodda Woreda, West Guji Zone, Southern Ethiopia

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Abstract

Drought is a prolonged period of abnormally dry weather conditions leading to an unadorned shortage of water and a natural temporary feature of the climate cycle that causes damage and can have severe impacts in most regions of the globe. The based current problem of drought this study was carried out to find the solution on the Influence of Drought and Coping Strategy focus Pastoralist at study areas. A total of 192 pastoral households were sampled using stratified random sampling. The data obtained were analyzed using descriptive statistics, inferential analysis, and Model specification analysis. The effects of drought on pastoralist community livelihoods in a mean range of 2.72-4.68 with a maximum standard deviation of 1.265 indicated drought on pastoralist community livelihoods and also largely influence pastoral coping mechanisms. Major pastoralist community coping strategies exercised were labeled using the highest mean rank order ranging from (4.47-1.59). The conclusion was pastoral households there is a need to accelerate the practice of pastoralist mode of life and development, and Coping strategies for the dual benefit of pastoralist mode of life like pastoralist competence development and social achievement, pastoral satisfaction, high performance, with better life to protect the resource wastage and to meet pastoral household demand for excellence.

Keywords: Drought • Copying strategy • Pastoralist • Severe impacts

Introduction

Background of the study

Drought is normally defined as a prolonged period of abnormally dry weather conditions leading to a severe shortage of water and a natural temporary feature of the climate cycle that causes damage and can have severe impacts in most regions of the globe [1]. Drought occurs when the seasonal precipitation drops below normal or long term average [2]. The Horn of Africa (HOA) region is characterized by drought, which is known to have the most far-reaching impacts of all-natural disasters.

About a century ago, the frequency of drought occurrence in the country was once every 10 years [3]. However, the special extent and frequency of drought events have both increased and it is now occurring once every five years or even less at different intensities causing significant impacts on agricultural output, economic loss, and adverse social consequences. This condition would increase the vulnerability of pastoralists to climate extremes, aggravated by the low adaptive capacity of households, which exacerbate other economic, social, and environmental problems [4]. Ethiopia is a country which has more than 12-15 million pastoralists who live in approximately 62% of the country's landmass predominantly in the lowlands of the country though it seems that this figure is a minority when it is compared to the rapidly growing population of the country which is close to more than 90 million [5].

Coping strategies refer to strategies that have evolved through peoples' long experience in dealing with the known and understood natural variation that they expect in seasons combined with their specified responses to the season as it unfolds [6]. In southern Ethiopia, pastoralists have been developed various possible coping strategies to overcome the distress effect of drought through their experience. However, the increased frequency of drought threatens to overwhelm these coping mechanisms and resilience of the pastoralists [7].

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Traditionally, the pastoralists were using rotational grazing; community-based restocking (Buusa-Gonofa), Ameessa (milking cow loan), mobility, migration, reducing food intake, bleeding, calf slaughtering and more recently destocking, livestock diversification, and livelihood diversification because of peripheral inspirations [4,8]. Knowledge about pastoralists' coping responses to drought stresses can guide possible intervention measures, as well as a better policy designed to reverse the decline in pastoral production systems, and hence ensure the continued sustainability of rural livelihoods in the pastoralist community.

The special extent and frequency of drought caused significant impacts on agricultural output, economic loss, and adverse social consequences [9]. This condition would be increased the vulnerability of pastoralists to climate extremes, aggravated by the low adaptive capacity of households, which exacerbate other economic, social, and environmental problems. To reduce these negative effects of drought, pastoralist coping strategies that have evolved through peoples' long experience in dealing with the known and understood natural variation that they expect in seasons combined with their specific responses to adverse drought risk. However, most of the coping mechanisms become less operable in many ways in today's situations:-expansions of farmland, land degradation, high human population growth, increasing in drought duration, intensity and coverage of drought with erratic, highly intensive and short duration rainfall has delimited pastoralist coping strategies [10].

The above researchers and others exerted their effort on drought impact and pastoral household livelihood diversification as coping strategies for rural risk management. Thus, this study would be expected to fill the gaps of duration and severity of drought, its effect, challenges, and the most important coping strategies used to alleviate existing pastoral frequent drought prevalence impacts. Therefore, this study came to fill the gap by assessing the effects of drought and coping strategies focus on the pastoralist of Melka Soda Woreda.

Research Hypothesis

Based on the specific objectives the following hypothesis is formulated

Hypothesis 1:

H0-There is no significant relationship between drought influence and pastoral coping strategies?

H1-There is a significant relationship between drought influence and pastoral coping strategies?

Hypothesis 2:

H0-There is no significant effect between pastoral coping strategies and factors affect coping mechanisms?

There is a significant effect between pastoral coping strategies and factors that affect coping mechanisms?

(Note: Factors of drought impact are: Socio-Economic, Environmental, water, and Pastureland)

(Effects on coping strategies: Human population Pressure, Deforestation, Expansion of Farmland, Improper settlement Pattern).

Research Methodology

Description of study area

The study was conducted in Melka Soda in the Guji zone, Oromia regional state. Melka Soda Woreda is one of the Woreda of the Guji zone. The Woreda is situated in Latitude/Longitude of 38°46'00" 38°46'45" E and 5°06'00"-5°07'20" N. Melka Soda Woreda is located in the northwest part of Guji zone. The astronomical location of Melka Soda Woreda is between 350 East and 300 West (Figure 1).

Research design

Both descriptive and explanatory research design employed for this research. To attain the objective of this research a community-based cross-sectional study design (both quantitative and qualitative approach) was employed. The descriptive research design used to describe the demographic

characteristics of respondents and Explanatory design using a quantitative approach of data collection and analysis.

There are a total of 32,376 household members who were registered in the Melka Soda administration office. The researchers were employed in-depth interviews with eight (8) informants and two FGDs from Woreda and Kebele officials, Aba Gada, community elders, and pastoralist workers. Therefore, the total numbers of the household head for three kebeles of Soda Garmama (858), Hidi Nagelle (1078), and the Baya Gundi kebeles of the population (1320) select as a study sample frame. To get adequate representation from the total population, statistical formula where applied [11].

$$n = \frac{N}{1 + N(e)^2}$$

Where, n is the sample size, N is the population size, and e is the level of precision. By using this formula at 93% confidence level and 7% level of precision the sample size obtained as follows:

$$3256 = 192$$

$$1 + 3256(0.07)^2$$

n=

The researchers were selected 192 respondents from the total members of the household head (Table 1).

The sampling techniques were both stratified and simple random sampling. The face to face interview was purposively selected.

The study was used in both primary and secondary sources of data. The primary data was collected through questionnaires, Field Observation, FGD, and a face-to-face interview. Secondary data sources were used in this research both hard copies and online materials such as published, unpublished, articles, project reports, and other data available at woreda.

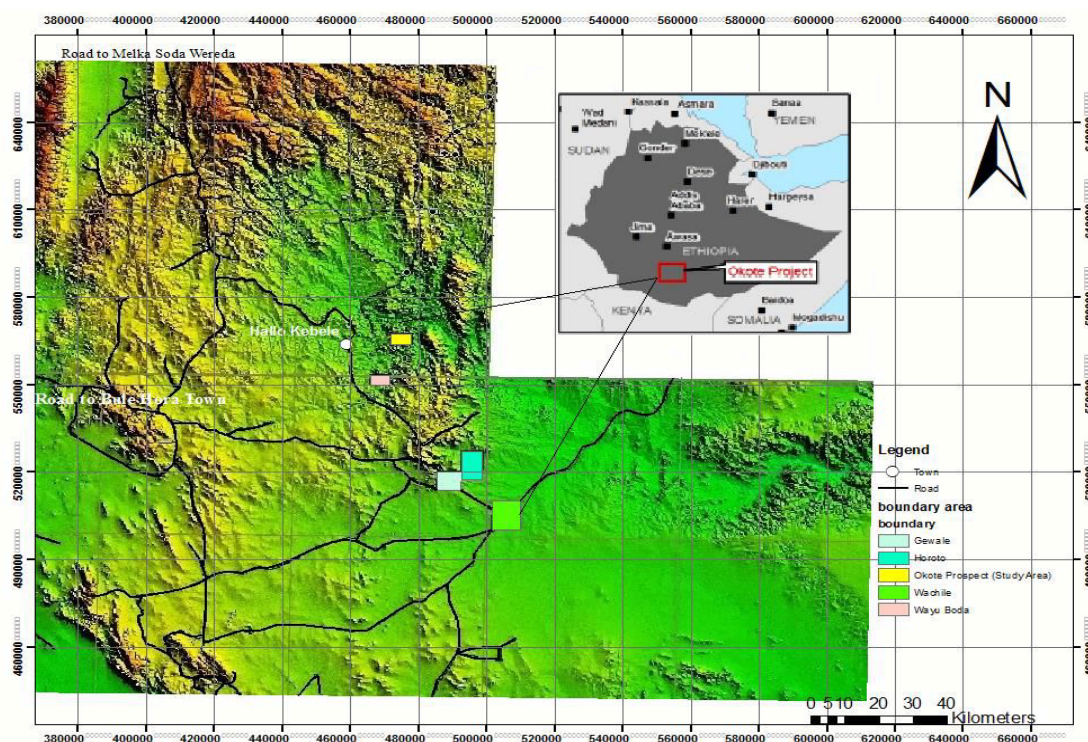


Figure 1. Location Map of Study Area.

Table 1. Sample Distribution.

Woreda	Name of Kebele	Total Population of Kebeles	Total Household Head	Sample Size	Respective %
Melka Sodda	Soda Garmama	7045	858	50	26
	Hidi Nagelle	10111	1078	64	33
	Baya Gundi	15220	1320	78	41
Total	3	32376	3256	192	100

Method of Data Analysis

Descriptive, inferential analysis and model specification

Quantitative and qualitative approaches were employed in the analysis of the data. The statistical summaries of the result were presented in the form of percentages and tables using computer data analysis package such as the statistical package for social science (SPSS-IBM version 20) and other relevant software to help interpret results. Regression Analysis was conducted to examine the three levels of the independent variable and for predicting the unknown value of a variable from the known value of two or more variables.

The Model was developed using three explanatory variables or predictors, which had influences on pastoral coping strategies. In this study, the equation of multiple regression models was; $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$, Where; Y-is the value of the dependent variable (Pastoral Coping strategies). β_0 – show the average effect on Y if all variables are excluded from the model. The parameters β_1 , β_2 , and β_3

are the regression coefficients of parameters X_1 - X_3 -independent variables Where (X_1 - Socio-Economic, X_2 -Water and Pastureland, and X_3 - Environmental impact, ϵ - The total error of prediction (residual)(Table 2).

Result and Discussion

Descriptive statistical analysis

Based on Table 3 result, pastoralist household participants were comprised of a greater number of male respondents 148 (77.9%); followed by female 42 (22.1%). Concerning the age of participants, almost all or majority of the pastoral households were in the working-age group, i.e. 21-50 years (80.0%). About 10(5.1%) of respondents are below 20 years. Concerning the academic status of respondents, comparatively most of them were did not attend school or primary school level 120(63.2%), whereas, 41(21.6%) of respondents were attending adult education. Those who had a certificate constitute only about 28(14.7%) and only 1(0.5%) of respondents is diploma holder. Concerning the duration of time lived in the area majority of respondents were either born in the area 72 (37.9%) or live long ranging from 5-20 and above years ago 105(55.3%). This shows respondents knew about the prevalence of drought and its effect.

Whereas only 10(6.8%) of respondents live in the study area for less than 5 years. Respondents categorized to pure pastoralist 105(78.9%) and local chief 40(21.1%). The respondents confirmed that household size was categorized under five groups of 1-3(13.2%), 4-6(25.3%), 7-9 (28.4%), and from 10-12(15.8%) and above 13 (17.4%). This shows a large number of family sizes were registered ranging 4-9(53.7%).

Pastoralist Owns of Livestock

As a result of Figure 2, 147(76.56%) of pastoralist households was replied that they had livestock holding ranging from 1-10 given for the number of Donkeys 147(77.4%), followed by camel 133(70.0%), poultry 120(62.50%), sheep 72(37.50%), oxen 45(23.44%), cattle 42(21.88%), Calf 35(18.23%), and Goat 31(16.15%). The result implies the pastoralist community by large subjected to donkeys and camel within such a small range (1-10) used for transportation long-distance voyage carrying goods and commodities to the market center. The number of livestock holdings ranging from 11-20 mostly given the nearest value for calf, cattle and oxen 73(38.02%), 72(37.50%) & 70(36.46%) respectively. Whereas, sheep 63(32.81%), goat 52 (27.08%), donkey 45(23.44%), poultry 37(19.27%), and the minimum number is given for camel 27(14.06%) observed in the same range of number. Similarly, the number of livestock holding by pastoralist households ranging from 21-30 was reported by the Goat with 70(36.46%), followed by calf 48(26.04), oxen 47(24.7%), cattle 46(24.2%), sheep 28(14.7%), camel 21(11.1), Poultry 20(10.5) and finally donkey 8(4.2%).

Regarding the number of livestock ranging from 31-40 the number of livestock accounts minimum in number. Accordingly, the number of goat given by 26 (13.7%), calf 20 (10.5%), cattle 18 (9.5%), sheep 17 (8.9%), oxen 16 (8.4%), poultry 13 (6.8%), came 19 (4.7%) and no Donkey registered.

Drought duration, magnitude and its severity

Based on the data of Figure 3, drought happens every two years which was confirmed by 127 (66.8%), followed by every five years reported by 50(26.3%). The two terms (i.e. every ten years and every year) were reported by an insignificant number throughout the year. Frequency of drought occurrence in the area categories into every two years which was affecting the pastoralist community adaptation and mitigation potential and exposed for food insecurity, and low income, deforestation, and weak natural resource management.

Drought severity in the area

Figure 4 shows, 67.9% of the respondents acknowledged that there was severe and very severe drought occurred and affects pastoralist livelihoods like availability of pasture land and water resource which triggers several interrelated effects. While moderate drought accounted for 32.11% contributed to the loss of livestock and harvest failure.

Current Economic Activities of Pastoralist

Table 4 indicated all respondents 190 (100%) confirmed primary activities were fully pastoralist livelihoods for a solid 1 year (12 months). Whereas, regardless of variation in the number of days the remaining income sectors performed as secondary activities These are petty trade which was reported by a majority of respondents 138(72.5%) and performed for 7 months, followed by handcraft reported by 76(40%) respondents and consumed 8 months. Next was cultivation, charcoal, and labor work each reported by 41(21.5%), 35(18.5%), and 25(13%) respondents. Regarding the number of days, the former performed for 3 months, while the last two consumed each equally 2 months. Therefore the severe drought prevailed in the pastoralist community the more pastoralist community was exposed to drought effects [12].

Common disasters

Figure 5 illustrates, 63.13% of the respondents' view and 25.26% of respondents' agree and strongly agreed respectively, towards common disasters was largely drought and dust storm that challenges drought coping strategies of pastoralist community. The responses for the flood was significant value rated about 11.58%, respondent was found to be agreed due to bare land in the area there was no water percolation and the runoff move over the surface of the earth and floods happened.

Causes of drought

The result of Figure 6 displays, participants confirmed drought a cause was happened due to lack of rainfall about 53.7% replied strongly agrees and 15.3% of them replied overgrazing as a major cause of the drought. Hence, in combination, 69.0% of respondents rated their agreement on lack of rainfall and overgrazing were the major causes of drought in turn influence the focus pastoralist livelihoods. Similarly, overstocking, lack of grazing, and water dry up together reported by 14%, 10%, and 6.8% respectively.

Metrology data analysis of min & max T° and rainfall 2004-2018

Figure 7 illustrates the average yearly minimum T° change was registered for each year of 15 years comparison indicated with the nearest value across 12 years for the given 15 consecutive years. The average yearly minimum T° difference registered across the year was insignificant. Specifically, the highest yearly minimum T° register for the year 2009 (14.7°C), followed by the year 2010(14.6°C) and 2015 average yearly minimum T° (14.5°C) was registered. Whereas, the lowest average yearly minimum T° registered for 2013 and 2008 given by (10.7 & 12.10°C) respectively. The result shows regardless of the small variation of average yearly minimum T°, there was a T° variability observed for the consecutive 15 years ago for the study area.

Figure 8 shows, average yearly maximum T° change registered for each 15 years comparison indicated with the nearest value across for the given consecutive years. The average yearly maximum T° difference registered across the years was insignificant (26.9-19.0=7.90°C). Specifically, the highest yearly maximum T° register for the year 2015 was (26.90°C), followed by

Table 2. Multiple Regressions.

S. No	Variables	Beta Coefficient(β)	Symbols Assigned
1	Socio-Economic,	β_1	X1
2	Water and Pastureland	β_2	X2
3	Environmental impact	β_3	X3
	Drought impact		Y

Table 3. Descriptive Analysis of Profile.

Respondent Profile	Item Characteristics	Frequency	Percent
Gender	Male	148	77.9
	Female	42	22.1
Below 20 years		10	5.3
Age	21-30 years	45	23.7
	31-40 years	58	30.5
	41-50 years	49	25.8
	above 51 years	28	14.7
Did not attend school		68	35.8
Education Level	Primary school level	52	27.4
	Diploma	1	0.5
	Adult Education	41	21.6
	Secondary school level	28	14.7
Born here		72	37.9
Duration of Time Lived in the Area	< 5 years	13	6.8
	5-10 years	45	23.7
	11-15 years	8	4.2
	16-20 years	25	13.2
	Over 20 year	27	14.2
No Household Size	1-3	25	13.2
	4-6	48	25.3
	7-9	54	28.4
	10-12	30	15.8
	Above 13	33	17.4

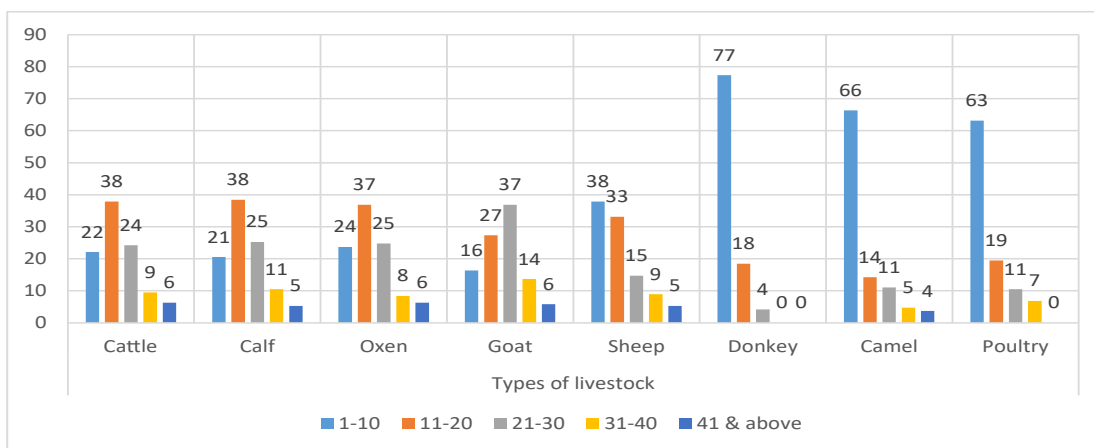


Figure 2. Pastoralist Owns of Livestock.

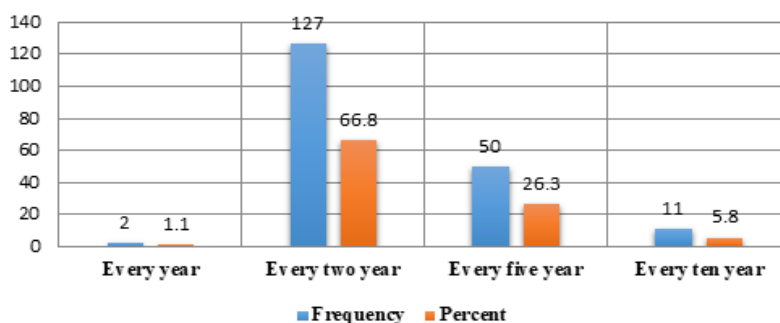


Figure 3. Frequency of Drought Duration and its Magnitude.

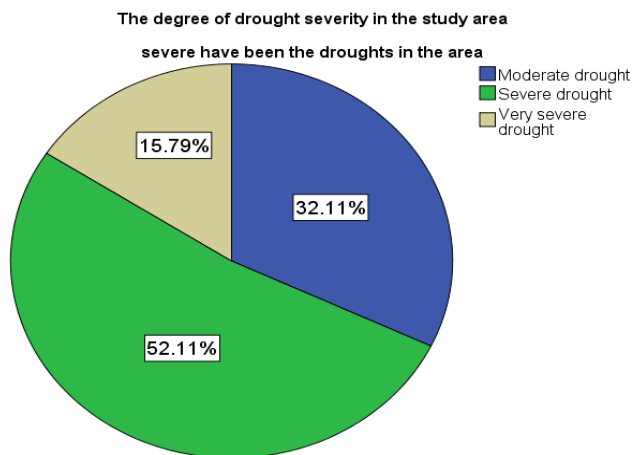


Figure 4. Drought Severity.

Table 4. Economic Activities Performed by Pastoralist.

Major Activity	Perform		No of Days in Month
	Primary	Secondary	
Pastoralist	190	0	12
Cultivation	0	41	3
Petty trade	0	138	7
Charcoal sell	0	35	2
Handcraft	0	76	8
Labor work	0	25	2

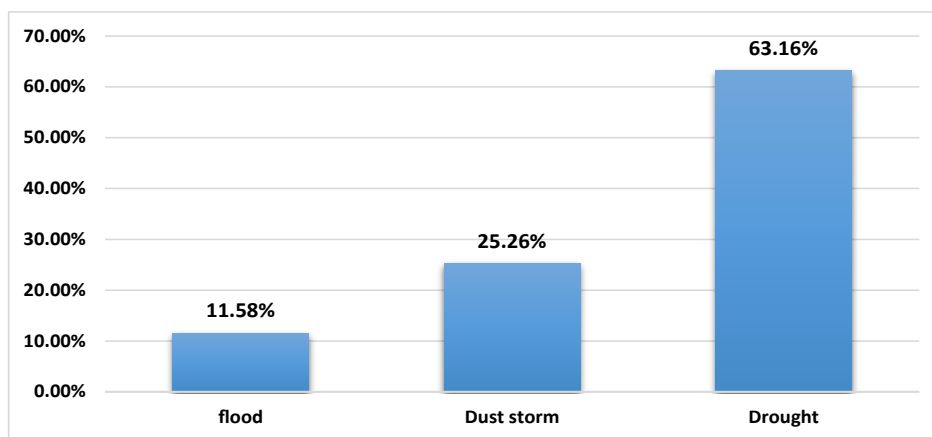


Figure 5. Common Disasters.

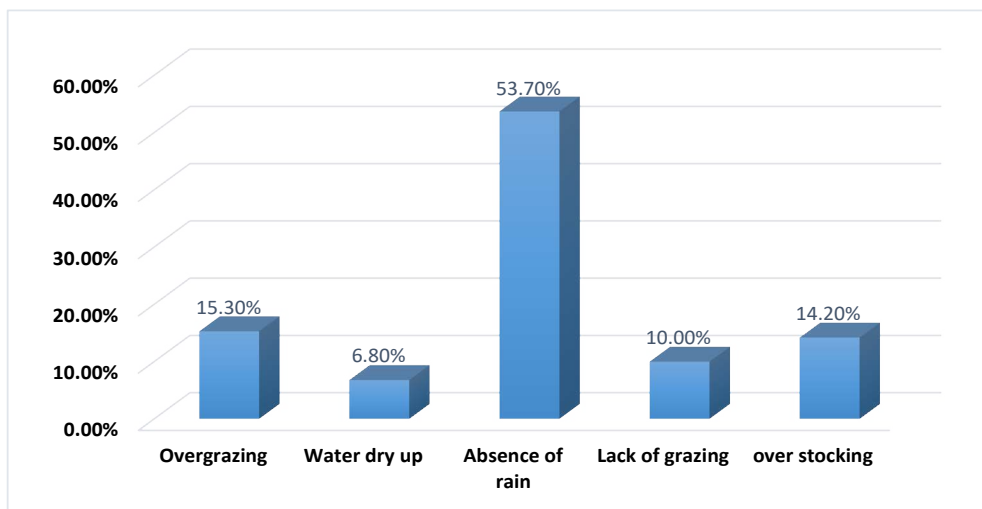


Figure 6. Drought Causes.

the year 2014 and 2016 equally accounted (26.2°C) and the year 2009 maximum T° (26.1°C) was registered. Whereas, relatively, the lowest average yearly maximum T° registered for 2008 and 2013 given by (19.8&19.00c) respectively. The result shows regardless of the small variation of average yearly maximum T°, there was a T° variability observed for the consecutive 15 years ago.

Based on Figure 9, the highest total annual rainfall of 72.8 mm was recorded in 2004, followed by 2010 total annual rainfall received was 67.4 mm. Whereas, the year 2012 recorded very low annual precipitation at 38.1 mm. Subsequently, very low annual precipitation was recorded in 2008, 2011 and 2014 with 40.6 mm, 42.1 mm, and 43.8 mm respectively.

Community perception towards change in temperature and rainfall

Variability: Table 5 pastoralist communities had an understanding of change in temperature for the last ten years. Almost all 187 or 98.4% of respondents reported that change in temperature for the last ten years. Pastoralist challenges community livelihoods and hibernated from exercising pastoralist mode of life regularly and faced with the threat of failure their formal mode of life due to the track of livestock production.

From the above table, all 190 or 100% of respondents report realized that patterns of rainfall for the last ten years was completely in decreasing trend and control the whole system in the pastoralist way of life. All 190 or 100% of respondents report realized that drought for the last ten years was completely increased from time to time and control the whole system in the pastoralist way of life.

Common source of water

Figure 9 illustrates, majority of respondents 159 or 83.7% replied that the most common source of water used by households in the area was tap water, followed by the dam which is reported by 17 or 8.9% and an insignificant number 14(7.4%) of respondents reported that the river is served as a common source of water used by pastoralist households. Women might walk for about 6 hours to find water for domestic use.

Ways of pastoralist to get out of drought effects

As Figure 10 result, 75 or 39.5% of pastoralists get relief from the authorities to get out of the drought impact. Similarly, 62 or 32.6% of respondents family or own initiatives was also a ways pastoralist get out of the drought impact. The remaining, like; assistance from relatives, NGOs, and friends each accounts for 24(12.6%), 15(7.9%) and, 14(7.4%) of the way pastoralist respondents get

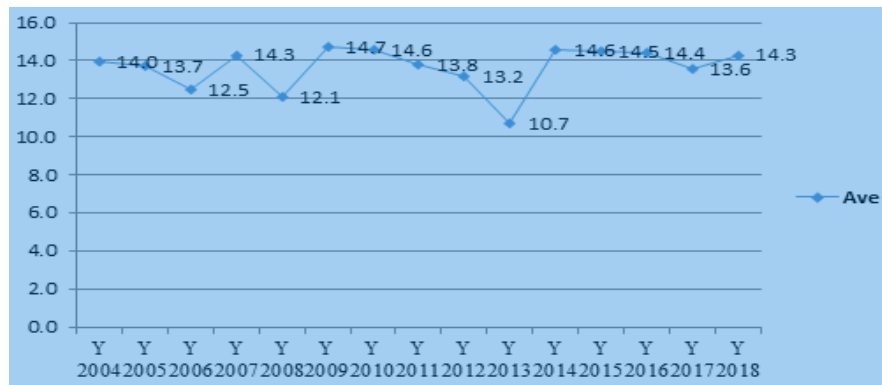


Figure 7. Yearly Average Minimum T° Analysis.

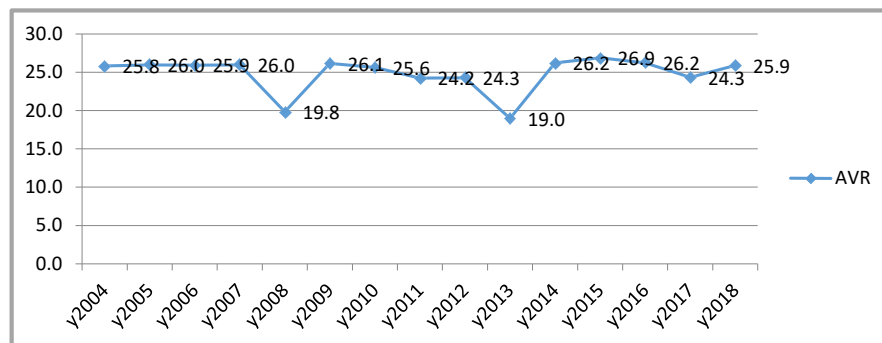


Figure 8. Yearly Average Maximum T° Analysis.

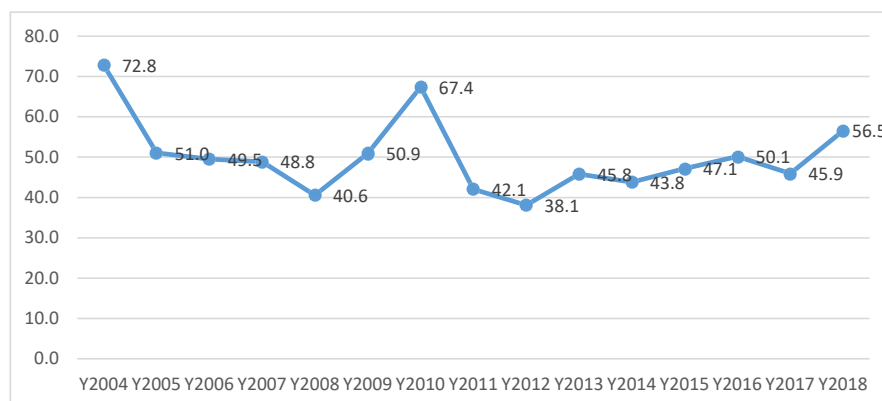


Figure 9. Annual Rainfall Division of 2004 – 2018.

Table 5. Distribution of Change in Temperature for Last 15 Years.

Temp			Rainfall			
Trends	Frey	(%)	Trends	Frey	(%)	
1	Increasing trend	187	98.4	Decreasing trend	190	100
2	Decreasing trend	3	1.6	Increased trend	190	100
	Total	190	100			

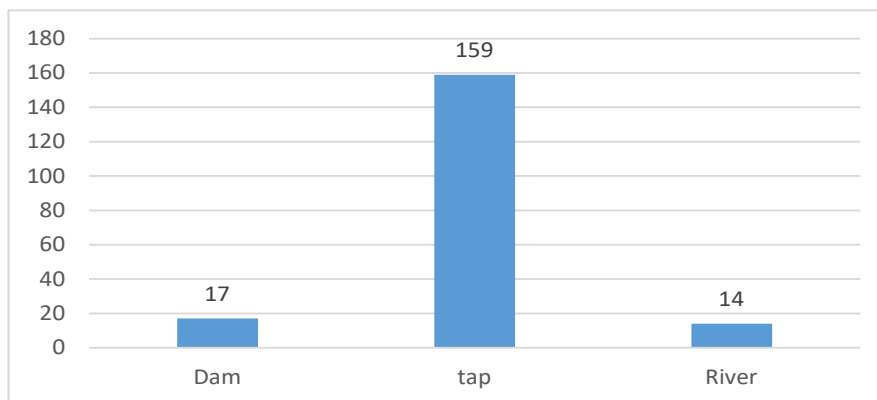


Figure 10. Common Source of Water.

out of the drought impact. This shows that pastoralist communities have social networks and economic strategies to get out of drought impacts with recurrent drought effects.

The effects of drought on pastoralist livelihoods

As Table 6 results, the highest average (4.68) and SD (0.561) was given to food insecurity. The big average was the migration of pastoralists with a mean of (4.62) and SD (0.677). Further, the following average is given for temperature and rainfall variability with a mean of (4.57) and SD (0.714). When it comes to factors like those drying of water resource average was (4.52) and SD (0.656), loss of livestock with mean of (4.51) and SD (0.747), the depilation of pasture reported with mean of (4.46) and SD (0.746). Whereas the prevalence of livestock diseases scored with average (4.29) and SD (0.964).

Diminished human health scored with mean of (4.18) and SD (0.785) and mean of (4.08) and SD (0.737) given for the decline in livestock price. The degradation of environmental and natural resources scored with a mean of (3.92) and SD (0.887). Whereas, school dropout scored with a mean of (3.91) and SD (0.849). Lack of labor replied with a mean value of (3.85) and SD (0.850) while, mean of (3.67) and SD (0.891) given for resource conflicts. The habitat fragmentation replied by mean of (3.59) and SD (0.885). Finally, crop and livestock and harvest failure replied each equally with a mean score of (2.72) and SD (1.265). Thus, the perspectives of respondents on the impacts of drought on pastoralist community livelihoods replied with a grand mean (4.018) which means, category of big challenges to aggravate the impacts of drought on pastoralist livelihoods and largely affect pastoralists throughout the year.

Similarly, the respondent forwarded that in the past, when the drought prevailed in the community, there was an active indigenous drought effect management system that automatically solves the problem. Nowadays, the interruption of government through the relief food aid forces unlike the indigenous institutions disturb the system. To this effect, recovering indigenous pastoral drought coping strategies were the major problems to handle drought effect and intensity factors related to pastoralist livelihoods. This result agrees with the argument of [13].

Major pastoralist coping mechanisms

Based on Figure 11, Pastoral livestock mobility was reported by a high average (mean score value 4.47) with (SD 0.703). This implies the pastoral livestock mobility was the most popular method to cope with drought impacts. Diversification of hardier was indicted mean score (mean score value 4.29) with (SD 0.995). This implies the pastoralist community tried to diversify herders to pass difficult times due to frequent and severe shocks of drought effect through

saving the homogeneous death of livestock. Similarly, saving and borrowing were reported by a high average (mean score value 4.26) with (SD 0.721), followed by Preserved grazing areas, to improve the ability of pastureland reported by (mean score value 4.11) with (SD 0.700). This implies in both items the level of agreement responses confirm with the interview: saving and borrowing and preserved grazing areas are major pastoral area drought coping strategies but currently no or poorly preserved pasture land and the culture of saving and borrowing is going to be declining.

Figure 11 displays, scored mean value for the fifth and sixth sub-construct i.e. splitting of herds and social assistance each reported by mean score value 3.89 & 3.72 with a standard deviation of 0.854 & 0.806 respectively indicated that respondents agreed on rating with relatively high homogeneity in their responses. The remaining coping strategies like engaging in income diversification, migration to town, and employment as casual labor and selling of charcoal and firewood each account (mean score value 3.68, 2.17 & 1.59) with standard deviation (0.781, 1.125&0.803) respectively.

Factors affect drought coping strategies

As Figure 12, human population pressure ranked with the highest mean of 4.14 and SD 0.995. Whereas, inadequate institutional capacity ranked by the second-highest scored mean 4.04 with SD 0.726 considered a big challenge. Human population pressure and inadequate institutional capacity have a strong influence on pastoral drought coping strategies. Similarly, land degradation and land tenure system are the next equally highest scored mean 4.00 with SD 0.914 & 0.931 respectively influencing pastoral drought coping strategies. Deforestation was still the highest mean value of 3.87 with SD 0.962.

Likewise, highly intensive and short duration rainfall ranked highest scored mean of 3.52 with SD 0.877 and high poverty level also reported by scored mean of (3.05) and SD (0.974). The increase in drought duration and intensity and improper settlement pattern each equally reported by mean of (3.00) and SD (0.975&0.914) respectively. In the same way, the expansion of farmland by mean of (2.89) and SD (0.962). Major factors challenging pastoral drought coping strategies were human population pressure, inadequate institutional capacity, land degradation, and land tenure system.

Correlation between independent variables and pastoral drought coping strategies

A strong positive relationship was found between socio-economic and pastoral coping mechanism($r=0.945$, $p<0.001$), environmental factors and pastoral coping mechanism ($r =0.825$, $p<0.001$), and water and pastureland and pastoral coping mechanism ($r=0.825$, $p<0.001$), which are statistically

Table 6. Effects of Drought.

Drought Effects	Mean	Std. Deviation
Socio-economic Impacts		
Food insecurity	4.68	0.561
Migration of pastoralist	4.62	0.677
Loss of livestock	4.51	0.747
Prevalence of Livestock diseases	4.29	0.964
Diminished Human Health	4.18	0.785
Decline in livestock price	4.08	0.737
Lack of labor	3.85	0.85
Environmental Impacts		
Temperature and Rainfall variability	4.57	0.714
Degradation of environmental and natural resource	3.92	0.887
Habitat fragmentation	3.59	0.885
Water and Pastureland impacts		
Drying of water resource	4.52	0.656
Depilation of pasture	4.46	0.746
School dropout	3.91	0.849
Resource Conflicts	3.67	0.891
Crop and livestock	2.72	1.265
Harvest failure	2.72	1.265
Grand Mean	4.018	0.842

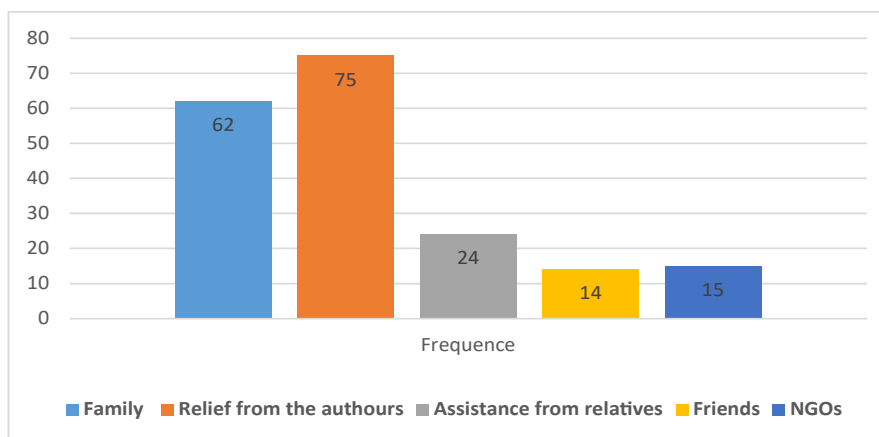


Figure 11. Drought Effect.

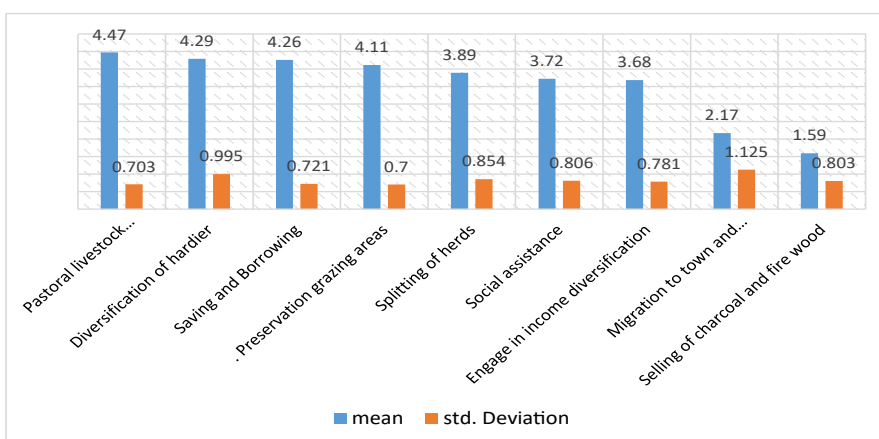


Figure 12. Major Coping Mechanisms.

significant at 99% confidence level. This implies that at a 1% level of significance it was discovered that the socio-economic, environmental factors and water and pastureland plays a significant role in determining the pastoral coping mechanism.

Multiple regression analysis

Multiple regression analysis was based on several assumptions, which

need to be considered for the technique to be successful. For results from multiple regression analysis to apply to a wider population, certain assumptions have to be met. The assumptions include:

Sample Size: The common rule of thumb floating about the sample size in standard linear regression is fifteen (3) cases of data per predictor (Fields, 2005 cited in Hacalu, 2016). Accordingly, to test the overall model

the recommended minimum sample size of $n=50+3k$, where k is the number of independent variables. Taking into account the seven (3) number of independent variables in the present study; $50+8(3) = 74$ which is less than observed respondents/sample size/. i.e. $50+8(3) = 74 < 190$. Based on the criteria, the sample size exceeds the minimum to run the standard multiple linear regressions.

Linearity: The assumptions require the mean value of the dependent variable for each increment of the independent variable to lie along a straight line, indicating a linear relationship.

Normality: This refers to the importance of the residuals or error in the dependent variable is normally distributed with a mean of zero [14]. As shown in the histogram below for each value of X the distributions of Y (i.e., the conditional distributions); though not identical or exactly normal by any means, do not appear to signal any major problems with normality or homoscedasticity.

Multi-co-linearity: The presence of multi-co-linearity in a research model reduces dependability on estimation and renders false sign-on beta coefficients for respective correlated variables tolerance in exploring the presence of multi co-linearity.

The dependent variable was pastoral coping strategies while the three (socio-economic factors, environmental factor, and water and pasture land) determinants of the pastoral coping mechanism were the independent variables. To determine the extent to which the explanatory variables explain the variance in the explained variable, regression analysis was employed (Table 7).

The R-value in Table 8 represents multiple correlation coefficients which show the correlation between predictors and the dependent variable. R2 represents the measure of how much variability independent variable was accounted for predictors in the model as a group taken together. In Tables 4-11 above-identified R-value as .963 which suggests that 96.3% is the value of multiple correlation coefficients between predictors and dependent variables. The R2 multiple correlation coefficients value shows the percentage variance in the dependent variable that can be explained by predictors, which as per the table is 92.7%. This meets the assumption of non-zero variance based on the fact that R2-value the variance in the predictor values is not equal to zero.

The third value that of the adjusted R2- value can be used to determine how the model can be generalized, where ideally the adjusted R2-value should be the same or closer to the R2-value which is 92.7%. Table 15 shows a difference in the model of 0.001 (0.927-0.926) which is small and means that if the model were applied to the population, it would account for 0.1% less variance in outcome. The significance or P-value should be smaller than 0.05 to be statistically significant.

In Table 9 the P-value is shown as 0.000 which is less than 0.5 indicating that the model has a significant fit to the overall data. Analysis of variance (ANOVA) of regression analysis between independent variables (socio-economic factors, environmental factor, and water and pasture land) considered and dependent variable pastoral coping strategies were examined. The table depicts that in regression, the value of the sum of squares is 70.000, the value of the degree of freedom (df) is 3, and the value of the mean square is 23.667.

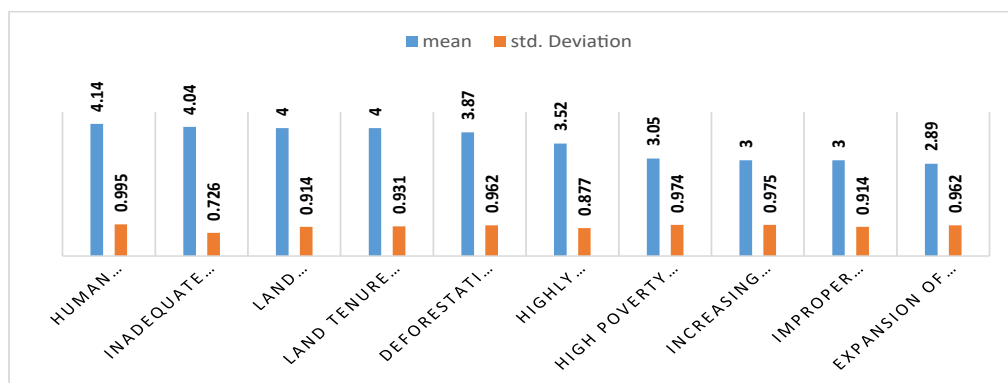


Figure 13. Factors Affect Drought Coping Strategies.

Table 7. Pearson Correlation (zero ordered matrix n=190).

		Socio-economic	Environmental	Water and Pastureland	Pastoral Coping Mechanism
Socio-economic	Pearson Correlation	1	.885**	.851**	.945**
	Sig. (2-tailed)		0	0	0
	N	190	190	190	190
Environmental factors	Pearson Correlation	.885**	1	.927**	.825**
	Sig. (2-tailed)	0		0	0
	N	190	190	190	190
Water and Pastureland	Pearson Correlation	.851**	.927**	1	.813**
	Sig. (2-tailed)	0	0		0
	N	190	190	190	190

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Field survey, 2019

Table 8. Regression Model Summary.

Model Summary b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.963a	0.927	0.926	0.173
a. Predictors: (Constant), Water and Pastureland , Socio-economic, Environmental				
b. Dependent Variable: Pastoral Coping Mechanism				

Table 9. ANOVA.

ANOVA ^a						
	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	71	3	23.667	789.802	.000 ^b
	Residual	5.574	186	0.03		
	Total	76.574	189			
a. Dependent Variable: Pastoral Coping Mechanism						
b. Predictors: (Constant), Socio-economic, Environmental, Water and Pastureland.						

Table 10. Coefficients of the Regression Model.

Coefficients ^a						
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.806	0.077		10.527	0
	Socio-economic	0.367	0.047	0.452	7.813	0
	Environmental	0.348	0.056	0.386	6.211	0
	Water and Pastureland	0.111	0.026	0.159	4.279	0
a. Dependent Variable: Pastoral Coping Mechanism						

The value of F-statistics is 789.80 which was significant at p<0.000. There is less than a 0.1 percent chance that an F-ratio, this large would happen if the alternative hypothesis false. The significant level in the ANOVA table shows, the combination of variables significantly predicts the dependent variable. On the other hand, in residual, the value of the sum of squares is 5.574 the value of df is 186 and the value of the mean square is 0.03. A good model should have a large F-ratio (greater than one at least) because the mean square regression will be bigger than the mean square residual.

Table 10 suggests the following multiple regression summary data and ANOVA table is necessary to investigate the beta coefficients of the model. The beta-value or unstandardized coefficients demonstrate the contribution of independent variables to the model individually.

To compare the different variables, you must look at the standardized coefficients, not the unstandardized ones. "Standardized" means that these values for each of the different variables have been converted to the same scale so that you can compare them. By recalling the model specifications of the variables from the methodology part, it was said that the unstandardized coefficients (β1 up to β3) are the coefficients of the estimated regression model.

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \epsilon$$

Where, Y = Dependent Variable (Pastoral Coping Mechanism)

β1=unstandardized regression coefficient of Socio-economic factors (X1)

β2=unstandardized regression coefficient of Environmental factors, (X2)

β3=unstandardized regression coefficient of Water and Pasture Land factors, (X3)

ε=error term

Taking into consideration the results from Table 10 the regression equation for the study was as follows:

$$Y = .806 + .367X_1 + .348X_2 + .111X_3$$

Based on the regression coefficients indicated in Table 10, all independent variables (socio-economic factors, environmental factors, and water and pasture land factors) had a positive and significant relationship with the pastoral coping mechanism. This is indicated by the level of significance of the variables that are less than 7%. Unstandardized coefficients keeping all other variables Constant, the socio-economic factors considered pastoral coping mechanism, the percentage of pastoral coping mechanism show a change by 36.7 percent, and environmental factors were used to consider pastoral coping mechanism the percentage of pastoral coping mechanism

show a positive change by 34.8 percent. For primarily attention on water and pasture land factors, the percentage of the pastoral coping mechanism shows a positive change by 11.1 percent, implies that, if the independent variables kept constant as they exist or make them unavailable, the pastoral coping mechanism of the pastoral community would be in danger. Standardized Beta Coefficient the standardized coefficients are the coefficients that explain the relative importance weight (RIW) of explanatory variables. The larger standardized coefficient is the higher relative importance and contribution to determinate of the pastoral coping mechanism of the public sector.

Interpretation:

A one standard deviation increase in standardized socio-economic factors is predicted to result in a 0.452 standard deviation increase in standardized pastoral coping mechanism holding constant the remaining variables.

A one standard deviation increase in standardized environmental factors is predicted to result in a 0.386 standard deviation increase in standardized pastoral coping mechanism holding constant the remaining variables.

A one standard deviation increase in standardized not water and pasture land factors was predicted to result in a 0.159 standard deviation increase in standardized pastoral coping mechanism holding constant the remaining variables.

Hypothesis testing and discussions

Hypothesis testing is the method of testing whether claims or hypotheses regarding a population are likely to be true. Here there are two hypotheses: null (Ho), and alternative (Ha). The significance (sig.) value expresses a value to accept or reject the (null) hypothesis. It is also called the P-value. The P-value is the probability that the correlation is one just by chance. Therefore, the smaller the P-value, the better would be. The general rule is to reject the Null hypothesis (H0) if P<.05 and accept (Ha) if P≥.05.

Ho1: Socio-economic factors have no statistically significant relationship with a pastoral coping mechanism.

From Table 11, the significant value for socio-economic factors is 0.000 which is less than the p-value of 0.05. Therefore, Ho1 is rejected, which indicates that socio-economic factors had a statistically significant relationship with pastoral coping mechanisms of selected pastoral households. Besides, the value of beta for socio-economic factors is (β=.452) this shows that socio-economic factors had positive relationships and it had a statistically significant relationship with a pastoral coping mechanism.

According to the arguments of [15], Socio-economic activities and environmental degradation move simultaneously, for example, over-exploitation of natural resources due to an extreme climate event is an alternative coping

Table 11. Coefficient and P-value of the Independent Variables.

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.806	0.077		10.527	0
	Socio-economic	0.367	0.047	0.452	7.813	0
	Environmental	0.348	0.056	0.386	6.211	0
	Water and Pastureland	0.111	0.026	0.159	4.279	0

a. Dependent Variable: Pastoral Coping Mechanism

strategy. These activities include productivity loss, increased forest fire hazards, reduced water levels, increased livestock, and wildlife mortality rates, and damage to wildlife and fish habitat. Socio-economic factors are expected to encourage the pastoral coping mechanism.

Ho2: Environmental factors have no statistically significant relationship organizational goal

From Table 11, the significant value for environmental factors was 0.000 which is less than the p-value of 0.05. Therefore, Ho₂ is rejected, which indicates that environmental factors have a statistically significant relationship with the pastoral coping mechanism of pastoral households.

Besides, the coefficient of beta for environmental factors was (=.386) shows that environmental factors have a positive and statistically significant relationship with a pastoral coping mechanism. Hence, the above-proposed hypothesis was rejected and the alternative hypothesis is accepted; which indicates that environmental factors have a statistically significant relationship with the pastoral coping mechanism of the pastoral households. FAO, 2018 stated environmental factors is extremely conducive to the implementation and adoption stages for the pastoral coping mechanism because failure to do environmental factors led for most programs are bound to fail. This shows the effect of drought on forests, deserts, and decreases the number of species.

Ho3: Water and pasture land factors have no statistically significant relationship with pastoral coping mechanism

In Table 11, the significant value for water and pasture land factors was 0.000 which was less than the p-value of 0.05. Therefore, Ho₃ is rejected, which indicates that water and pasture land factors have a statistically significant relationship with the pastoral coping mechanism of pastoral households. Besides, the coefficient of beta for water and pasture land factors was (β=159) this shows that water and pasture land factors have a positive and statistically significant relationship on pastoral coping mechanisms. Water and pasture land factors can help pastoral households required competence to cope with pastoral area hardship and how to perform livelihood activities and routines effectively in pastoral economic activities which were supported the work of [16].

Descriptive statistics results and discussions

The study summarized that the highest mean ranges between (3.85-4.68) responses of the respondent approach to strongly agree for factors related to socio-economic effects which negatively affect pastoralist coping strategies. Environmental factors were major impacts of pastoralist coping mechanisms as the majority of respondents' responses fall under high scored mean ranges between (3.59-4.57) approaches to strongly agree. Water and pasture land impacts like reported with a big challenge influencing and concerned about pastoral coping strategies with the highest scored mean value ranging (2.72-4.52). Major pastoralist community coping strategies exercised were labeled using the highest mean rank order ranging from (4.47-1.59).

The major factors affect pastoral drought coping strategies where human population pressure, inadequate institutional capacity, land degradation, land tenure, highly intensive and short duration rainfall, deforestation, high poverty, increasing drought duration and intensity, and improper settlement and expansion of farmland). Thus, the power of these factors influencing the pastoral coping strategies was reported with the mean score value ranging

from (2.89-4.14) and with a grand mean (3.551) categorized as competent challenges.

Generally, the effect of drought on pastoralist community livelihoods was mentioned as an independent variable a grand mean (4.018) with a maximum standard deviation of (0.842) indicated respondents agreed to the determinants of pastoralist coping strategies as dependent variables. This indicates that the effect of drought on pastoralist community livelihood had a significant relation with pastoral coping strategies.

Correlation, Regression Results and Discussions

The result of the correlation analysis showed that the relationship between all independent variables has a positive and significant relationship with the dependent variable (pastoral coping mechanisms) at a 99% confidence level (p<0.01). The correlation results indicated that a strong positive relationship was found between socio-economic and pastoral coping mechanism(r=0.945, p<0.001), environmental factors and pastoral coping mechanism (r =0.825, p<0.001), and water and pastureland and pastoral coping mechanism (r=0.825, p<0.001), which are statistically significant at 99% confidence level. This implies that at a 1% level of significance it was discovered that the socio-economic, environmental factors and water and pastureland plays a significant role in determining the pastoral coping mechanism.

The regression result revealed that the effects of pastoral coping mechanism determinants where Socio-economic factors, Environmental factors, and Water and pasture land factors on pastoral coping mechanisms. These determinants of pastoral coping mechanisms had a positive and significant influence on the pastoral coping mechanism in Melka Soda Woreda's pastoral households.

Similarly, the multiple correlation coefficients show the correlation between the predictors and the dependent variable. R₂ represents the measure of how much variability independent variable was accounted for predictors in the model as a group taken together. The R-value is Table 8, 0.963 which suggests that 96.3% is the value of multiple correlation coefficients between the predictors and the dependent variable. The squared multiple correlation coefficients, R₂-value shows the percentage variance in the dependent variable that can be explained by predictors was 92.7%. This meets the assumption of non-zero variance based on the fact that R₂-value variance in the predictor values, in this case, is not equal to zero.

The third value that of the adjusted R₂- value can be used to determine how well the model can be generalized, where ideally the adjusted R₂-value should be the same or closer to the R₂-value which is 92.7% shows a difference in the model of 0.001 (0.927-0.926) which is small and means that if the model were applied to the population, it would account for 0.1% less variance in outcome.

Conclusion

The main aim of this study was to identify the Influences of Drought and Coping Strategy focus pastoralist the case of Melka Soda Woreda. The result of descriptive statistics showed that most of the respondent response found strongly agrees on ranges for all independent variables influence on pastoral coping strategies. This indicated that the pastoral coping mechanism by pastoral households was determined by predictors (socio-economic factors, environmental factors, and water and pasture land). The correlation analysis

shows that the three (socio-economic factors, environmental factors, and water and pasture land) that determine the pastoral coping mechanism of pastoral households had a significant and strong positive relationship with socio-economic factors, environmental factors, and water and pasture land of pastoral households.

Regression analysis (R-square) was identified the R-value as 0.963a which suggests that 96.3% was the value of multiple correlation coefficients between the predictors and the dependent variable. The squared multiple correlation coefficients, R²-value shows the percentage variance in the dependent variable that can be explained by predictors, which as per 92.7%. This meets the assumption of non-zero variance based on the fact that R²-value the variance in the predictor values, which in this case is not equal to zero.

The third value that of the adjusted R²- value can be used to determine how well the model can be generalized, where ideally the adjusted R²-value should be the same or closer to the R²-value which was 92.7% shows a difference in the model of 0.001 (0.927-0.926) which were small and means that if the model were applied to the population, it would account for 0.1% less variance in outcome. Therefore, the three variables had a significant relationship with the pastoral coping mechanism of pastoral households in Melka Soda Woreda. Accordingly, socio-economic factors, environmental factors, and water and pasture land, with a beta value of (0.452, 0.386, and 0.159) respectively. Therefore, all null hypotheses were rejected, and instead, alternative hypotheses were accepted.

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Conflict of Interest

Author declared no conflict of interest.

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