Assessing Community Perception on Climate Change and variability, Its Impacts and adaptation strategies in Anlemo woreda, Hadiya zone SNNPR

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Research Article

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Abstract

The study assessed the rural community perception of climate change and variability, its impacts, and adaptation strategies in Anlemo woreda. The study was used purposive sampling techniques to select woreda and both kebeles. The sizes of the sample household respondents were 191 out of each, 30 participants were female-headed households. Both qualitative and quantitative methods of data collection and analysis were used. A time-series analysis was used to show the trend of temperature and rainfall. The researcher used the Coefficient of variation and percent of deviation to discern rainfall variability. The findings of the study showed that both maximum and the average temperature had increased, belg rainfall had decreased, whereas annual and Meher rainfall had increased and showed inter-annual and seasonal variation. The researchers also showed that the district is experiencing increasing land degradation, spatially soil erosion, nutrient depilation, and deforestation are perceived as impacts of climate variability. The results revealed that most of the people perceived long-term variability in the pattern of rainfall amount and distribution and an increasing trend and variability of temperature. Therefore, farmers are undertaking different adaptation and coping mechanisms. Providing training, increasing accessibility to infrastructure, the credit services market, and introducing new technologies are forwarded as recommendations.

1. Introduction

Climate change and variability are long-term environmental issues that trick serious threats to vulnerable and impoverished agro-pastoral communities worldwide (FAO 2008). Global climate change encouraged by increased greenhouse gas attention would be extensively accepted by the international community (IPCC, 2014). Variability of climatic elements, especially rainfall and temperature, may affect agricultural production as they influence the production elements like soil moisture and soil fertility, length of the growing season, and increased probability of extreme climatic conditions (Aklilu, et.al, (2009a), (Goodwin, N. R. (2008)., although with special variations.

Climate change and variability impact adversely the environment, human health, food security, economic activities, resources, and physical infrastructure. Although all social, economic, and political sectors face the impact of climate change and variability at varying degrees, the worst hit is supposed to be rain-fed agriculture due to its high sensitivity to climate stimuli, (Temesgen D. (2008). For this reason, when this sector is impacted, it disrupts the food production system, the food security status of households, and domestic industries. It is also very well recognized that the consequences of climate change and irregularities vary spatially in magnitude. For example, the countries of Sub-Saharan Africa are the most vulnerable and since many countries of this region are already food insecured; climate change and variability aggravate and worsen the problems (Daniel, 2008).

An increase in the intensity and frequency of extreme weather events and climate variability has raised broad concerns over global climatic changes since they affect human livelihood activities and strategies. Rainfall and temperature are the most crucial hydrology and climatic variables often used for the characterization of climate change and variability (C. S. Sharma et al., 2016). Rainfall variability and other climatic risks account for a significant share of agricultural production decline in developing countries (FAO, 2010).

Higher temperatures and changing precipitation levels caused by climate change will depress crop yields. This is particularly true in low-income countries, where adaptive capacities are perceived to be below (Haakanson, 2009), Ayanlade, et, al. (2016).. Many African countries, including Ethiopia, which has largely based weather-sensitive economic activities, are highly vulnerable to climate change. This vulnerability has been demonstrated by the devastating effects of recent flooding various prolonged droughts and too late or early rainy seasons of the twentieth century. Thus, for many poor countries that are highly vulnerable, understanding farmers' responses to climate variation and climate change are crucial in designing appropriate coping strategies (Yesuf et al. ., 2008), (Ali, A., 1999).

Perceptions about climate change, its cause, impacts, and the necessary response mechanisms to cope with climate calamities are important for any population in a given community, (Hannah. A et.al, (2010);. The level of awareness determines the scope of implementation that needs to be taken to tackle the problem. Lower awareness will make the intervention mechanisms to be very slow and untargeted. For instance, local peoples have a range of strategies to cope with drought. However, these traditional coping mechanisms are based on local knowledge and are not supported by research.

According to Daba, the understanding of extreme weather events, their significant impacts on crop and livestock production will enable rural farmers to prepare a local response to the anticipated impacts of climate change. The problem of climate change in Ethiopia has the potential of undermining sustainable development efforts; steps are not taken to respond to its adverse consequences. This measure depends on farming community perception and response. However, there is no available information concerning perception and experiences on climatic variability (Daba MH (2018), Adane, K., (2009).

In this study area, the impact of climate change has adverse impacts on crop production, animal rearing, the health of farmers, and the quality of natural resources. The existence of rising temperature and declined rainfall leads to reduce the agricultural production of the farmers. As a result, the area is seriously affected by climate change and weather variability. Adaptation to climate change requires that farmers using traditional techniques of agricultural production first notice that the climate has altered. Farmers need to identify potentially useful adaptation strategies /methods and implement them.

There is no research work in the study area on climate change concerning the perception of rural communities towards climate variability, its effects, and local farmers' adaptation strategies. Therefore, the present study would make a substantial contribution to the endeavors of bridging this research gap by investigating climate change, perception and its impact and adaptation strategies of the local people in Anlemo woreda, Hadiya Zone of SNNPR, Ethiopia. The objective of this research paper is to investigate climate change/variability: the perception and its impacts and responses made to overcome the impacts of climate change and variability.

2. Methodology And Design Of The Study

2.1. Description of the study area

The study would be conducted in Hadiya Zone, Anlemo Woreda, which is geographically located between 70 30’-70 51’ North latitude and 37051’- 380 06’ East longitudes (AWFEDO, 2019). This source also explains the neighboring Woredas and Zones: in the north and northwest Silt Zone, in the east Shashogo Woreda, in the south and southwest Limo Woreda are located. In addition, Anlemo Woreda is 18 km far from Hosanna a town of Hadiya Zone in Southern Nation, Nationalities and Peoples Regional State (SNNPR), and it is about 212 km far from Addis Ababa capital city of Ethiopia and 178 km west of Hawassa capital of Southern Nation, Nationalities and Peoples Regional State (SNNPR).

2.2. Analysis on the Pattern and Trend of Climate Variability

In this study, rainfall and temperature variability would be computed using anomaly index and PCI. The perceptions of smallholder farmers on rainfall and temperature changes through time were analyzed using binary logistic regression descriptive statistics and qualitative analysis. **Anomaly Index**: The anomaly index was used to study the annual variability of rainfall and temperature in the study area from 1990 to 2020. The rainfall and temperature anomaly indices will be calculated by the following equations:

2.2.1. Model specification

Logistic regression is used to describe data to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval, or ratio-level independent variables. Many scholars use different models according to the aim of the research. The study would apply the logit model (logit regression analysis) to examine the characteristics that best explain the variation in the measures of attitudes of the farmers’ perception and adaptation level to climate change and variability and factors that influence such decisions, (Gajurati ND (2004).

The parameter estimates of the logit model provide only the direction of the effect of the independent variables on the dependent (response) variable, but estimates do not represent either the actual magnitude of change or probabilities (Deressa, 2010). The logistic model considers the relationship between a binary dependent variable and a set of independent variables mentioned below, whether binary or continuous.

The logistic model for ‘k’ independent variables (X_1, X2, X 3————————————. Xk),

The logistic regression model is given by $P(X) = \alpha + \sum_{i=1}^{ki} \beta i X i$…………………… (1)

(Exp) (βi) indicates the odds ratio for a person having characteristics i versus not having i, while βi is the regression coefficient, and α is a constant. Thus the estimated regression coefficient associated with 1 or

0 coded dichotomous predictors is the natural log of the perception of farmers and demographic data associated with climate change.

The logistic model also can be written $\ln\left(\frac{p(y|x)}{1-p(y|x)}\right) = \ln\left(\frac{p}{1-p}\right) = \beta_0\beta_i x$ ———————(2)

This implies that the odds for success can be expressed as $\frac{P}{1-P} = \square\ \beta o + \beta 1X$ ——— (3)

This relationship is the key to interpreting the coefficients in a logistic regression model

(logit model).

Models relationship between set of variables X_i dichotomous (yes/no)

P (“Success” |X) = $e^{\beta o}+^{\beta 1}x$ …………………………………………… (4)

1+ $e^{\beta o}+^{\beta 1}x$

The hypothesized model for the determinants of local farmers’ perceptions of climate variability is shown in Eq. (10).

FPL = $\sigma_0 + \sigma_1 X_1 + \sigma_2 X2 + \sigma_3 X3 + \sigma_4 X4 + \sigma_5 X5 + \sigma_6 X6 + \sigma_7 X7 + \sigma_8 X8 + \sigma_9 X9+$” …… (5)

3. Result And Discussion

This chapter discusses and presents observation results of climate variability and change, local peoples perception of climate change, impacts of climate change, coping mechanisms and adaptation practices and barriers to adaptation in the study area based on results obtained from the household survey, historical rainfall and temperature records, and qualitative information generated from various groups of the community and concerned officials through FGDs and interviews.

Of the total 191 respondents, 84% (161) and 26% (30) were male and female respectively. According to the field survey, the age-sex composition of the sample population is presented in Table 2. On the other hand, 42% of the respondents are aged between 34–64, the age between 18–33 42% and 12% is > 65. This means that both young (physically active) and old people are involved in farming. In some studies, the age of farmers has a direct bearing on the availability of able-bodied manpower for agricultural production and also on the ease of adoption of climate change adaptation strategies (Adebayo et al 2012). Also (Montle and Tewelde medhin 2014) showed that the age of household head influences agricultural production.

Table 1
The age and sex composition of the sample house were discussed.

Variable		Sample household	
		Freq	%
Sex	Male	161	84
	Female	30	26
	Total	191	100
Age	18–33	80	42
	34–64	87	46
	> 65	24	12
	Total	191	100
Source, Field survey, 2020			

3.1. Marital Status and Household size

According to the field survey, the distribution of the household by the number of people is mainly dominated by a household with 4–6 members. The household head with less than or equal to 3 members makes up 8.4%. Households with 4–6 members constituted 74.7% and households with 7 and above constituted the remaining 16.9%. Some studies show that large household size might have a positive impact on the improvement of productivity especially if members fully participate in farming activities and those households are more likely to adapt to climate change (Mugula and Mkuna 2016). Also, Gbetibouo (2009) showed that households with large sizes are more willing to choose soil conservation techniques as labor-intensive adaptation measures, especially in small-scale farming.

3.2. Educational status

Scholars believe that education is important to determine readiness to adopt new ideas, enables people to realize the diversification or specialization of livelihood activities and technology, within the framework of adaptation strategies on the impact of climate change.

Table 2
Shows that the educational status of respondents

Variable		Educational Status Responses	
		Freq	%
Educational Status	Illiterate	59	30.9
	Read and write	11	5.8
	1–8	22	11.5
	9–12	71	37.1
	> 12	28	14.7
	Total	191	100
(Survey, 2020)			

As shown in table.2, from the total number of respondents 30.9% are illiterate, 5.8% can read and write, 11.5% of them are categorized in grades 1–8, and 37.1% of them are 8–12, and 14.7% of the above grade 12. This shows that most of the HH of the Woreda are illiterate or able to read or write. Although, the illiterate may harm the local community in seeking an appropriate and feasible solution from their experience and traditional system to cope with and adapt to the changing climate change-induced shocks so they have their indigenous knowledge and experiences.

3.3. Climate change as perceived by the local people

If climate change is happening, it has a direct or indirect impact on life. By having this understanding, the respondents were asked their feeling about the situation of rainfall, temperature, and related issues. According to the survey, almost all of the respondents and the focus group from selected kebeles discussion participants indicated that there is a change in the duration of rainfall from the past two to three decades onwards. In addition, the respondents showed that the temperature is increasing. They mentioned some pieces of evidence as for the problems related to the change. Some of the occurrences related to climate change are stated in their order of severity in the table below.

Table 3
Problems related to climate change

Experiences	Responses			
	Yes		No	
	Frequency	%	Frequency	%
Inconsistence of rain fall	150	78.5	41	21.5
Increasing temperature	158	83	33	17
Heavy rains and hails	119	62.3	72	37.7
Crop disease with outbreak	120	62.8	71	37.2
Food shortage	108	56.5	83	43.5
Drought	34	17.8	157	82.2
Water scarcity	100	52.4	91	47.6

Indicators of climate variability between 1986 and 2020 in Anlemo the study was designated to understand whether the farmers had experienced climate variability during the last 20–33 years. Through questionnaires, the study showed that most farmers had experienced increasing temperature (83%), inconsistence of rainfall (78.5%), problems with frost (72%), crop diseases outbreak (62.8%), food shortages (56.5%) as well as drought (17.8%) and Water scarcity (52.4%) (Table, 3). Further, the study established that these farmers′experiences may also serve as key indicators of climate variability in Anlemo. As one of the household respondents put it:

“The rain does not fall as it used to. We used to know the time it will rain, but

these days it can rain even during harvesting time and it is misleading people.

Once you plant the rain goes and the seeds dry up. So the rain is misleading

people”

3.4. Community Perception on the causes of climate change and variability

The communities' perception of climate variables and changes such as temperature and precipitation behavior of the area in past was investigated. The results reveal that a slightly higher proportion of farmers claimed that temperature is increasing and rainfall is decreasing and noted extreme weather change in the frequency of floods and droughts.

Change of climate was well perceived by farmers of the study area as most of them have been observing changes in temperature, precipitation, and timings of rainfall and related frequent drought. Particularly, perceptions on temperature and precipitation change of farmers of the study area (Table 4). The result indicates that most respondents, about 97.9%, perceive that there is a climate change, while 1.6% of respondents perceived that there is no change in climate or they did not know about climate change. Similarly, 91.1% of respondents feel that the temperature of Anlimo was increasing in the last three decades, whereas 4.2% of them noticed that they were not aware of temperature change or they did not feel the temperature change.

Furthermore, the farmers in the study area were experiencing climate change or variability. As revealed that about 95.3% of the respondents understand surely rainfall variability pattern in the area and they pointed out that it is a common phenomenon in the area nowadays. Rainfall comes late and goes early compared to the situation 15 years ago. On the other hand, 31.5% of the respondents reported that they understand the change of rainfall variability to some extent. Only 3.7 respondents said that they are not sure of the change or variability of the rainfall in the area. As observed from key informants and group discussion, there is a change not only in the total amount of rainfall but in the timing of the rains, with rain coming either earlier or later than expected and with rain withdraws before the normal time. About 79.1% of the respondents observed the late starting of rainfall from the normal date and 86.4% of the respondents approved the early termination of the rainy season from the normal date.

Table 4
Farmers' perception of climate change and variability

Perception	Number of Respondents					
	Yes, there is		No, there is no		I do not know	
	Freq	%	Freq	%	Freq	%
Do you think that there is climate change in your local area?	187	97.9	3	1.6	1	0.5
Is there a change in the amount of rainfall during the main rain season?	182	95.3	7	3.7	2	1
Has the timing of the onset of rain in the main season shifted?	187	97.9	3	1.6	1	0.5
Has rain started late than normal?	151	79.1	20	10.5	10	5.2
Is rain of main season early withdrawn than normal?	165	86.4	12	6.3	8	4.2
Do you feel the temperature of the area is changing?	166	86.9	13	6.8	12	6.3
Do you feel the temperature is increasing?	174	91.1	9	4.7	8	4.2
Do you think that there is the fluctuation of rivers and streams water volume	174	91.1	8	4.2	9	4.7
Do you feel frequent occurrence of drought	174	91.1	14	7.3	3	1.8
Do you feel temperature is decreasing	11	5.6	177	92.7	5	2.6
Do you think that decline of agriculture yields	187	97.9	3	1.6	1	0.5

Source: Survey data 2020

3.5. Farmer's perceptions about effect of climate change on food crops

In the study area, the shortage and fluctuation of rainfall that occurred due to climate change and/or variation have been highly affecting crop production. In the farmer interview, 91.6% of the respondents confirmed that climate change and/or variability harm crop production where 49% of these respondents indicated as the effect was very high, 42% and

22.5% reported as the effect was high and medium respectively. On the other hand, during the FGDs, the participants explained that some other factors like crop disease, pests, and crop weeds which have been mainly emerged due to climate change have contributed to crop failure in the study area.

Because of these, challenges, crops yield in the area decline from time to time. Comparing recent seasons' harvest with that of what farmers used to produce using similar inputs, all FGDs, key informants, and most respondents indicated as current yield became lower in the area. In this regard, 28.5% of the respondents reported as yield became very low, 68% reported as it low and only 3.5% said as they produce the same yield. Besides, climate change/variability-induced challenges, high cost of inputs, and difficulty in accessing inputs were the other factors that contributed to the decline in crop yield in the area. Livestock rearing is the other agriculture segment affected by climate change/variability. Woreda agricultural experts, FGDs, and key informants have explained the existence of adverse influence of climate change/ variation on livestock production and productivity in their respective discussions. 97% of the respondents reported as climate change/variability adversely affects their livestock rearing. Shortage of water and pasture, and the occurrence of various diseases were the major problem that affected the livestock population in the area. It was also indicated as many farmers encounter a shortage of feed for their livestock mainly during drought seasons and as a result, many livestock became physically weak, farming animals unable to plow, their products like milk and meat declined, and livestock price became very low.

3.6. Climate data analysis

Temperature

According to NMSA (2019), the average annual minimum temperature over the country has increased by about 0.38℃, whereas, the average annual maximum temperature has increased by about 0.1℃ every decade (NMSA, 2019). Temperature distribution in the study area was characterized by a general trend of increased and annual variability. Temperature is one of the elements that determine weather conditions as well as the climate of an area. It is recorded as maximum and minimum daily, monthly and annual temperatures. Annual maximum, minimum, and average temperatures are presented in Annex 1 and it shows the warmest year was 2019, while the coldest year was 1990. Generally, the trend of temperature shows a slight increment from year to year. The average temperature of the study area has increased by 0.67ºC in the past 30 years with an annual increment of 0.22ºC. On the other hand maximum and minimum temperatures increased by 0.71ºC and 0.64ºC respectively in the past three decades.

According to the data obtained from NMSA, the average temperature of the woreda understudy ranges between 15.21 ºC and 18.45 ºC, while the average maximum temperature ranges between 21.7ºC and 24.3ºC. Accordingly, the annual minimum temperature ranges between 8.02ºC and 12.5 ºC in the past three decades.

The annual maximum temperature has shown a decreasing trend as well as the minimum the temperature has shown an increasing trend with a rate of 0.05 0c, even higher than the average annual temperature trend (Figure 2). Furthermore the mean average the minimum temperature has increased by about 7% and the mean annual maximum temperature decreased by about 2% from the year 1986 to 2020 with inter-annual variability of 5% and 2% respectively. From this, it is possible to conclude that though the mean annual maximum temperature has been decreasing, there has been an overall increase of temperature in the study area.

Rainfall

The annual rainfall of Anlemo *woreda* ranges between 396 mm as the minimum, and 1180mm as maximum, for the past 30 years. The data analysis result shows annual rainfall has a decreasing trend in the past three decades. The amount of rainfall showed yearly fluctuation between 1986 and 2019 (Fig. 4). The average rainfall of the *woreda* is 1001 mm in the past three decades.

Source: NMSA

These slight reduction amounts and the high variability of rainfall brings difficult to predict the situation. This affects especially farmers whose life is dependent on rain-feed agriculture. Therefore, the sum-up of the perception of the people and the metrological data shows, the rainfall is slightly decreasing and highly variable.

Monthly rainfall distribution and variability

As in most of Ethiopian *woreda's* Anlemo *woreda's* rainy months are Jun, July, August, and September while November, December, and January are the lowest rainy months. As shown in the following figure, the wettest month is August, while the driest month is December with an average rainfall of 20.98 mm. On the other hand, the wettest season is *kiremt* (summer), while the driest season is *bega* (winter). Relatively, *belg* (spring) is the second rainy season in the *woreda*.

3.7. Climate change impact on agriculture and crop productivity

Ethiopia has historically suffered from climate variability and extremes. Rain failures contributed to crop failures, deaths of livestock, hunger, and even famines in the past. Even relatively small events during the growing season, like too much or too little rain at the wrong times, can spell disasters. Small farmers and cattle herders, who are already struggling to cope with the impacts of current climatic variability and poverty, face daunting tasks to adapt to future climate change.

3.8. Local Adaptive strategies

One of the intended objectives of this study was to assess some of coping and adaptation methods being practiced by farmers along with community-based adaptation strategies in response to negative effects of climate change and variability. As stated by World Bank, (2010), local existing knowledge is one and the most important adaptive strategies in overcoming the challenges of climate change and variability. In the study, the researcher has assessed both the previous and currently existing local community's adaptation strategies/mechanisms.

Table 5
Local adaptation strategies by kebele

Current adaptation strategies	Responses					
	Yes		No		Total	
	Freq	%	Freq	%	Freq	%
Diversify income source, use improved agricultural input, and sell livestock	107	56	84	44	191	100
Using different type of crop varieties	117	61	74	39	191	100
Applying short season crop variety	128	67	63	33	191	100
Diversify income source	101	53	90	47	191	100
Use irrigation	10	5	181	95	191	100
Use improved agricultural inputs	136	71	55	29	191	100
Use early matured crops	71	37	120	63	191	100
(Survey, 2020)						

As indicated in Table 5, 56% of the interviewed farmers responded as they use diversified income sources, use improved agricultural input, and sell livestock adaptation strategies. Specifically, 67% responded as they utilize, Applying short-season crop, and the other 53% responded as they employ diversified income sources in their adaptation effort. The other, 71% of respondents reported that they use improved agricultural inputs. 37% of the total respondents indicated as they use early matured crops and 5% as they use irrigation.

The current generation also uses some of the above-mentioned and some more adaptation strategies. Diversify income sources, use irrigation practices, use improved agricultural inputs (improved seeds and), early mature crops, sell livestock, temporary migrate, support from relatives, and food aid. In many cases, adaptation choices among small-scale farmers are limited by inadequate financial resources and knowledge. Therefore, reducing vulnerability is a key aspect to improving small-scale farmers' resilience.

3.9. Determinants of farmers land management practices as means of adaptation: logistic regression model

In the previous chapters, some of the specific research questions were discussed using descriptive statistics such as cross-tabulation and percentage distribution. Moreover, the the researchers tried to look at the relationship among the respondent's socio-economic, demographic, and policy and institution-related characteristics of the farmer in the study area. In addition to this farmer perception about the problem of climate variability and their response to their coping mechanisms are discussed. However, this was not enough to make a deduction and explore the predictive power of the independent variables. The background variables of the respondents were also analyzed by applying the binary logistic regression model. In the field, the targeted populations were asked questions regarding their response to the problems. Among interviewed 191 respondents 88(73.3%) of the total population respond to land degradation as the problem of climate variability in different ways and the remaining 32(26.7%) farmer households did not respond to the the problem of land degradation as the problem of climate variability one way or another.

Age, sex, literacy, household size, farm size, contact with extension agents, Access to climate information, availability of credit services, farmers' perception as a problem were taken as predictors to fit the model. These predictors (independent variables) are believed to have the power to predict the probability of occurrence of the outcome variable (land management). This is to means that, the probability or likelihood a respondent has towards land management practices are explained by these independent variables. For this purpose, the binary logistic regression model is the multivariate statistical tool that was used for the analysis of the subject matter. For simplicity, only those variables statistically significant are discussed.

The binary logistic regression model showed that there is no significant relationship between the age of farmers and terracing, but the relationship is positive since the value of Exp (B) is greater than 1 (Apex 1). A one-unit increase in the age of farmers is found to have increased odds of manure application by a factor of 1.89 and the result is statistically significant ($p < 0.05$). On the other hand, male-headed households are expected to perceive climate change and adaptation, as better endowed with labor. In this research too, positive and significant relationships between the sex of household heads and perception are observed and the result is statistically significant ($p < 0.05$). For the analysis, male sex is given a code of 1 and for female sex code, 2 is given. Taking male-headed households as a reference group; the odds of perception among female-headed households was only 1.75 times that of the male-headed households (apex 1). The finding conforms with the assumption that men are more likely to perceive than women.

4. Conclusion

4.1. Conclusion

Local community peoples' perceptions of climate change and variability are in line with the climatic records except for annual and *meher* rainfall amount. The composition of the household participating in the survey, regarding the gender of the households the majority were found male and the remaining households (40.6%) were female-headed. This figure indicated that the participation of female households in agricultural activities was relatively low in the study area. Therefore, an effort has to be exerted to promote and enhance the participation of females in all aspects of agricultural activities. Female households, their participation in agricultural as well as community development activities were reasonably improved compared to the previous trend. But, the proportion of females in the stunt areas was significantly less to that of male counterparts. Thus, attention must be given to female households as long as better natural resource prevention is concerned

Communities of Anlemo have been facing climate variability and change impacts but today the impacts have become more serious as there has been more climate variability and change-induced disasters as compared to the situation in the past. Generally, the people in Anlemo are facing a declining trend of crop and animal productivity because of erratic rainfall, drought, increased temperature, the intensified occurrence of pests and diseases, and environmental degradation. Most of the households can read and write. From this result, one can realize that a significant number of the sample respondents can read and write and can understand and implement their activities as to their capacity. The education level of households was composed of 30.9% illiterate heads, and 5.8% of the households can only read and write. The rest of the households, constituting 11.5% are at primary education level, while only 37.1% of the households were found at high school education level.

Declarations

Declaration of competing interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Figures

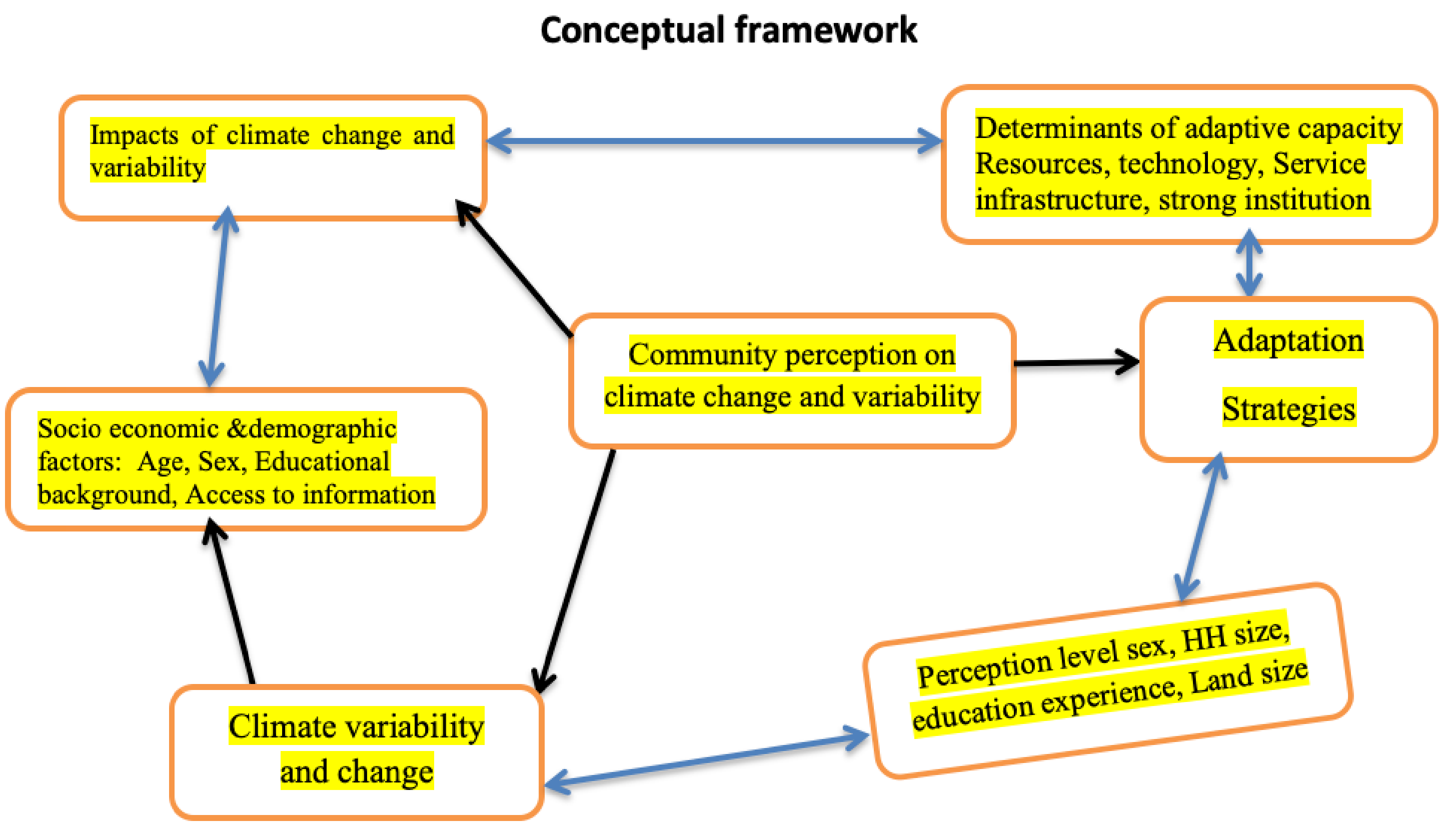

Figure 1

The conceptual framework for the study of rural communities' perception towards climate change and variability and adaptation mechanisms concerning socio-economic and demographic characteristics. (Developed by the Author from the review of literature)

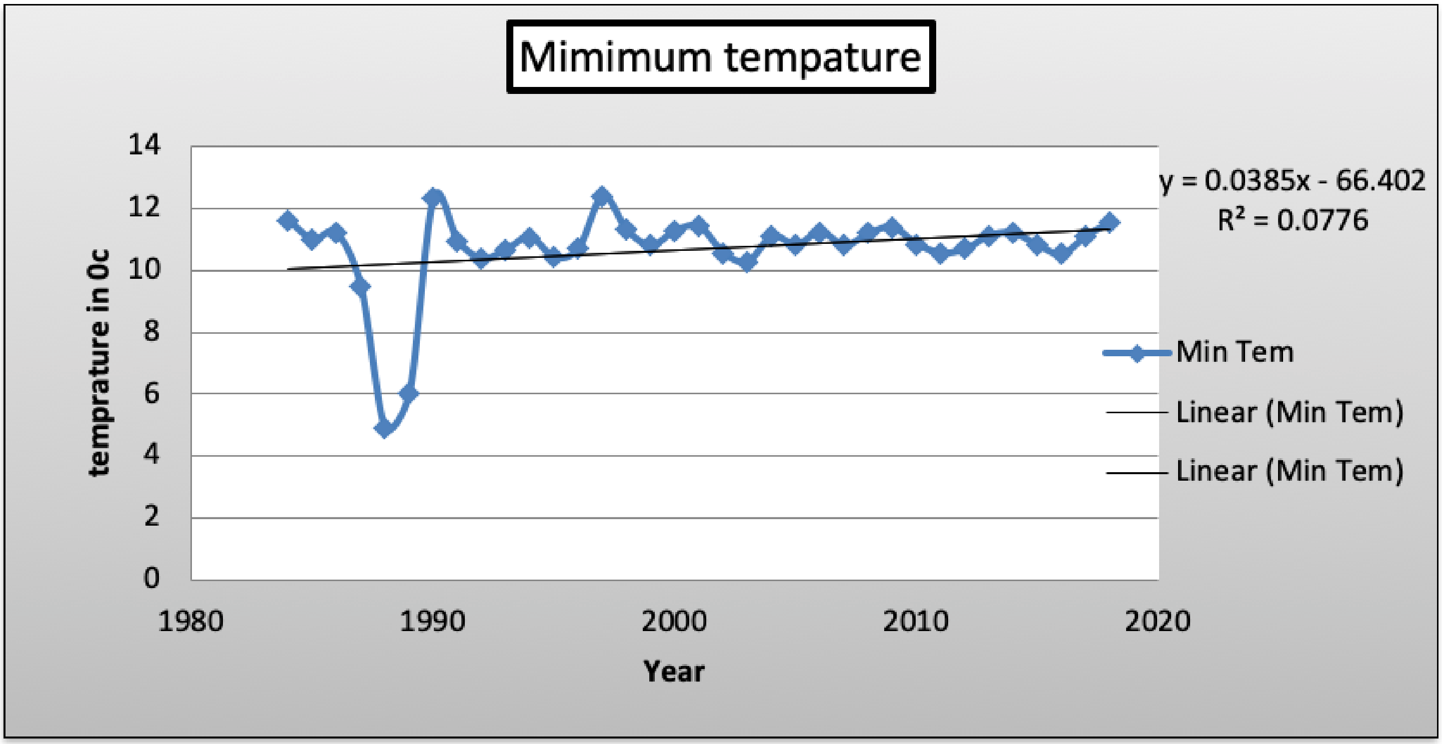

Figure 2

Minimum Temperature

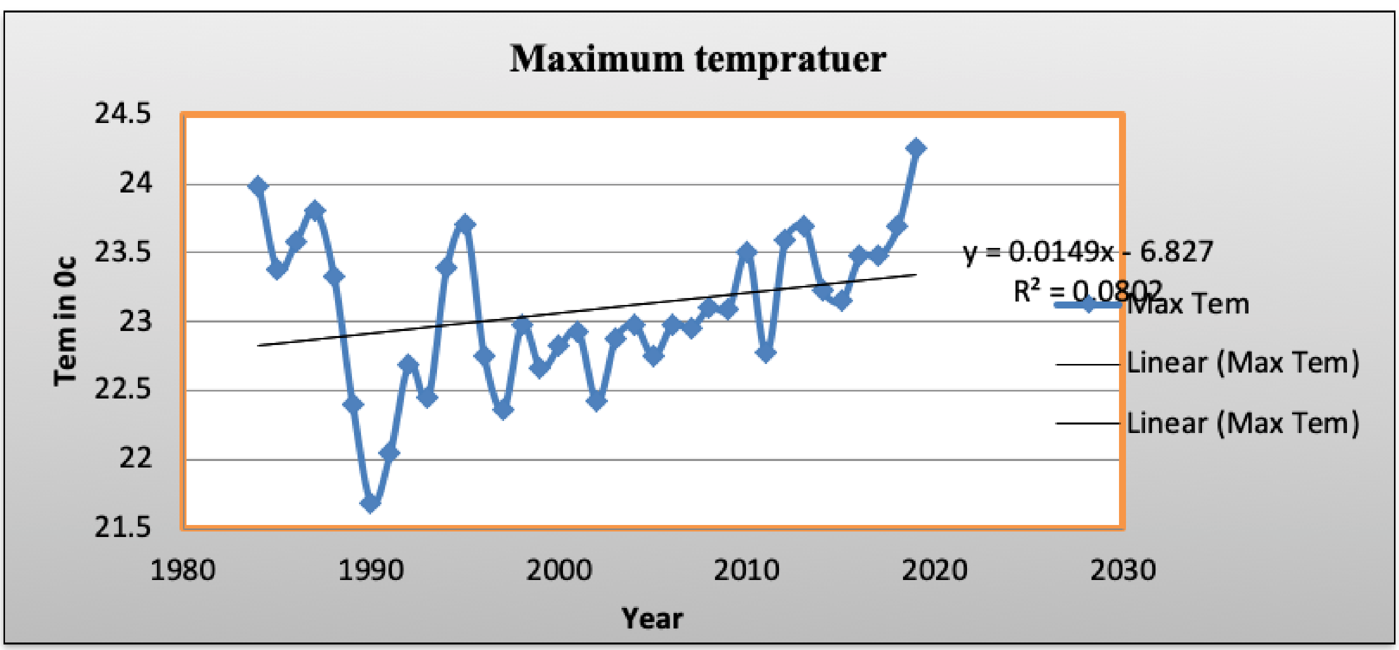

Figure 3

Minimum Temperature

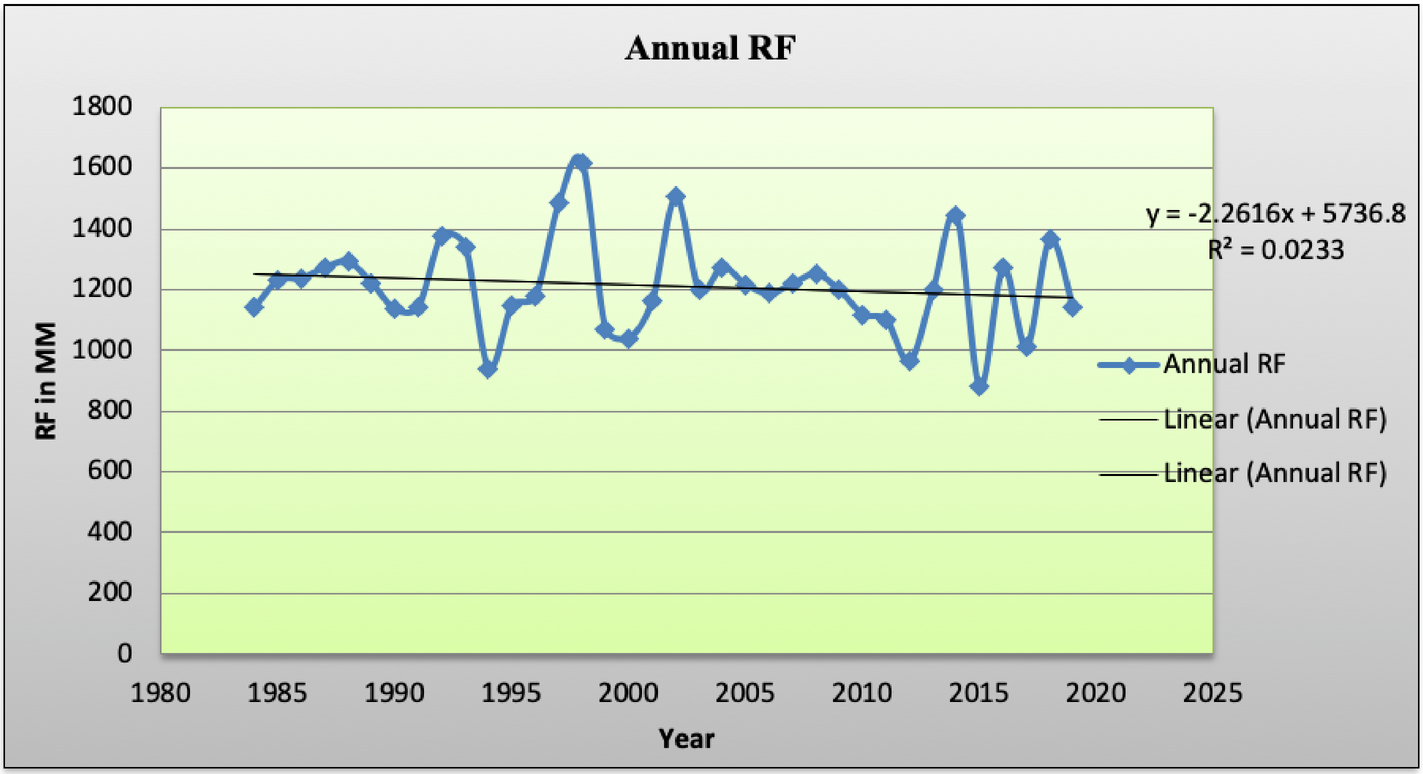

Figure 4

trend of annual Rainfall

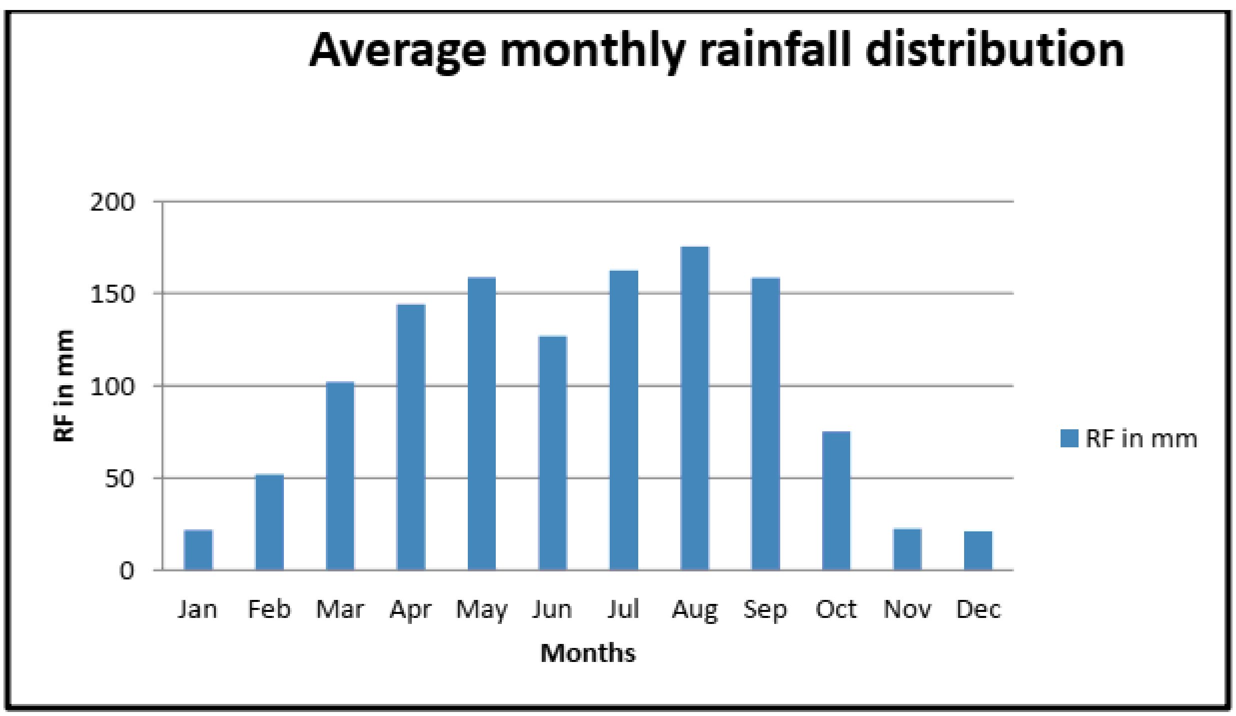

Figure 5

Seasonal rainfall distribution

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