Farmers' Perception to Climate Change and Variability: The Case of La'Ilay Maichew Woreda, Central Tigray, Ethiopia

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Abstract
Climate change and variability is rapidly emerging as one of the most serious global problems affecting many sectors in the world and is considered to be one of the most serious threats to sustainable development. The impact of climate change depends on severity of the natural resource degradation and the technological capacity of the people to cope up the changes in climate. La'ilay Maichew woreda in Tigray regional state, is not an exception in this context. Farmers have been making efforts to cope up the adverse impact of climate change and variability by using different adaptation methods. Adaptation method is largely site-specific and site-specific issues that require site specific knowledge. Thus, this research was initiated to address the knowledge gab: to assess the information on perception of farmers towards climate change and variability. Quantitative design was primarily employed for the study. The essential data were collected from 130 randomly selected farm households using semi-structured interview schedule. Descriptive statistics were used for analyzing quantitative data. The study has established that rainfall and temperature in study area have been decreasing and increasing respectively. Majority of the farmers in La'ilay Maichew woreda recognize this increase in temperature and the reduction in the volume of rainfall. In general, increasing farmers' awareness on climate change and variability risk perception, improve farmers' income-earning opportunities, Moreover, access to extension and credit services are essential to cope up the adverse impact of climate change and variability in La'ilay Maichew Woreda.
Keywords: Climate change and variability, perception

1. INTRODUCTION

Evidence is accumulating that the Earth's climate is undergoing change, and observations are consistent with scientific expectations concerning the increasing concentrations of greenhouse gases in the atmosphere. Global temperatures have already increased by approximately 0.6°C over the last century. In addition, the IPCC projects that average global temperatures will increase by 1.4 to 5.8°C this century (PCGCC, 2004). Human activities, such as fossil fuel burning and deforestation, have altered the global climate resulting in increased temperature, variable amount, intensity and distribution of precipitation and sea level rising (IPCC, 2007). According to same report, this anthropogenic effect is expected to continue in the foreseeable future; with changes in ecosystem service, which affect the people.

Tigray region is the most affected region in Ethiopia due to climate change and variability. The overall natural resources base of the region is highly degraded. This initial potential together with the current global warming aggravates the vulnerability of the people to climate change impacts. Various reports agree that the region has been facing all droughts that have occurred in the country indicating susceptibility of the region to climate change and variability. Deressa *et al*. (2008) indicated that the most significant climate change impact in Tigray is due to drought and flood. Even a mild water stress during the crop growth period has resulted in complete failure in this region (Oxfam, 2010). Thus, people in the region, the study area is not the exception, are facing a variety of shocks and become vulnerable.

Sometimes farmers' perception about climate change is no evidenced from weather monitoring stations (Maddison, 2006). In most cases of Ethiopia, people perceive declining in rainfall and increased in frequency of drought but it did not confirmed from weather station. Research report from Oxfam (2010) indicated that observations on metrological stations lack congress with local farmers' perception. This could be resulted due to the fact that farmers assess rainfall in relation to the needs of particular crops at particular times; small changes in the quality, onset, and cessation of rain over days or even hours can make a big difference, whereas meteorological data is more likely to measure totals and larger events. Maddison (2006) also argued that this lack of congress between farmers' perception and metrological records could be emanated from the analysis of short term climate data and/or due to averaging of record from wider areas.

The climate of the study area, La'ilay Maichew woreda, is highly unpredictable characterized specially by unreliable rainfall. Rainfall distribution in the area is characterized by high temporal and spatial variability with annual precipitation ranging from 354.6 to 1037.0 mm. The frequently experienced climatic shocks, in the woreda, are prolonged drought and delay in the onset of rain, erratic and low precipitation, and heavy and unseasonal rainfalls. This diverse climate in the area influences the livelihood activities of the people. Farmers in the area who depend on crop production for their livelihood are facing a variety of shocks and become vulnerable.

Generally in the study area research with regard to identification of farmers' perception is either scanty or it is not in a way policy makers and practitioners can use them. Therefore, understanding the level of awareness of the people about climate change is essential to develop and strengthen adaptation options to reduce its adverse impact. There for this study attempted to address how do farmers understand climate change?

2. RESEARCH METHODOLOGY

2.1. Description of the Study Area

2.1.1. Location

Tigray is one of the national regional states of Ethiopia which is located in the North part of the country between $12^0$15'N and $14^0$57'N latitude and $36^0$27'E and $39^0$59'E longitude and covers an area of 53,000 square kilometers. The region is bounded by Eritrea to the North, the Sudan to the West, and the Ethiopian regions of Amhara and Afar to the South and the East respectively. The study area, La'ilay Maichew woreda, is one of the 36 woreda in Tigray regional state of Ethiopia, part of central Tigray zone. Geographically, it is located on the coordinates of 13 ^{0} 15'N latitude and 38 ^{0} 34' E longitude in semi-arid tropical belt of the country. It is situated about 245 kilo meters to the North West of Mekelle (the regional capital) at an altitude of 2148 meter above sea level.

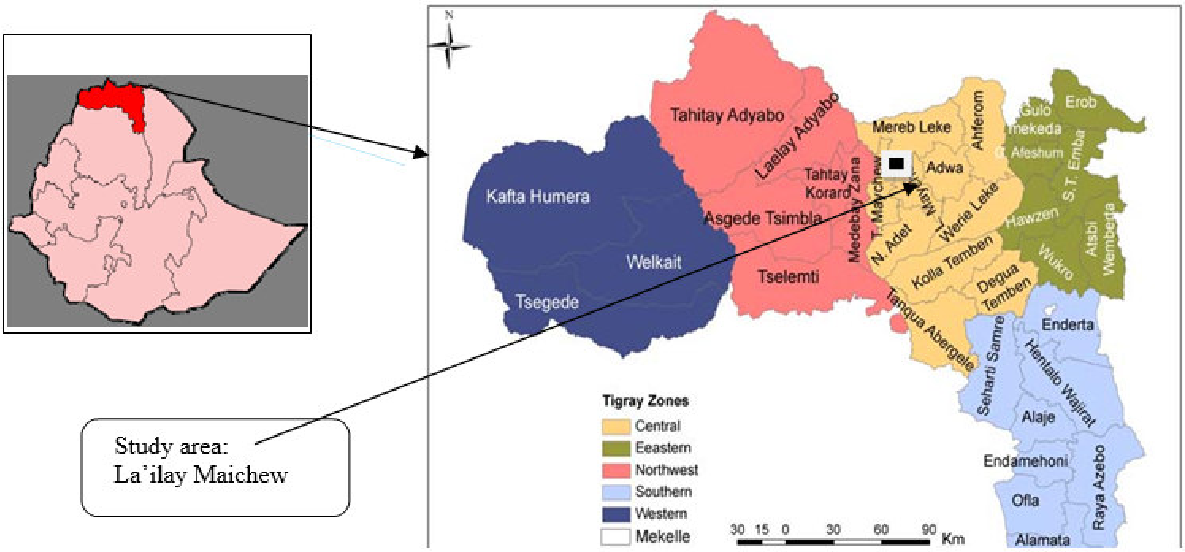


Figure 1: Map of Tigray region and La'ilay Maichew woreda

2.1.2. Demography

La'ilay Maichew woreda is inhabited by a total population of 82098, of which 40599 are men 41499 are women (TEPALUAA, 2012). The female and male population of the woreda accounts for 50.5% and 49.5% of the total population respectively. According to the CSA (2007) no urban inhabitant is in the woreda. With an area of 566.5 square kilometer, the woreda has a population density of 144.9 persons per km^2. Generally, this population density is higher than Tigray regional state, 92 persons per km^2, and that of the country, 67 persons per km^2. According to the same report, the household size of the woreda is 4.7. This is almost the same to the country level average household size of 4.9 for rural. The number of households in the woreda accounts 15001 of which 27.6 are female headed households and 72.4 are male headed households (TEPALUAA, 2012).

2.1.3. Climate and agro-ecology

The climate of Tigray is highly unpredictable characterized specially by unreliable rainfall. The region is a semi-arid area characterized by a long dry season, with a main rainy season between June and September. Tigray Region belongs to the African dry land zones often called the Sudano-Sahalian region. Rainfall distribution in the region is characterized by high temporal and spatial variability with annual precipitation ranging from 500 to 1000 mm. Average annual rainfall varies from 200 mm in the eastern lowlands to over 1800 mm in the western highlands.

The rain season of the study area, La'ilay Maichew woreda, is monomodal (concentrated in one season which is from July to September) and receives from 354.6 to 1037.0 mm of rain fall per annual for the years 1961-2015. The mean minimum and maximum monthly temperature ranges from 8.7^0c to 13.2^oc and 24.4 ^{o}c to 31.4^oc respectively (NMA, 2010). The woreda is classified in semi arid tropical belt with a 'Woina Dega' (middle altitude) agro climatic zone. According to the new agro-ecological classification the woreda is grouped under SM2-5D2. There are different soil types in the woreda, which exist in combination of 70% clay silt 70%, and 12.26%) sand (LMWBoARD, 2010).

2.1.4. Socio-economic condition

Livelihoods in Tigray region are significantly dependent on agricultural income options supported by off-farm income generation such as labor trading and petty trade. However, agricultural production and diversification remain low. In this region the average size of land available to a four persons is about 0.5 hectare, too small to support the family on agricultural production alone. The average production of cereals (the major agricultural output) is less than 7 quintals per household in the drought prone areas and this level of staple cereal production can only feed a family only for 5-8 months a year at best (Kidane, 2006).

2.2. Survey Design and Data Collection

Qualitative data were used to supplement and to fill gaps inquired during the quantitative data collection process, particularly at exploratory phase. In order to have clear idea and to identify priority issues to focus on for the formal survey, exploratory study was first carried out. Through this survey, information about the agro-ecological, socio-economical, institutional and physical features of the study area in general and climate conditions in particular were collected. Here the researcher used a checklist outline. Group discussion (four groups), key informants interview and informal discussion with farmers, subject matter specialists of the woreda, and development agents were among the employed tools.

Based on the knowledge gained through the exploratory phase the formal survey was framed as follows. In order to get representative information and to draw important policy implications for future research and development endeavors employing sound methodological principle is a pre-requisite. Towards this end, two stage sampling procedure was used. In the first stage, out of the total of 15 *tabias* (the smallest administrative unit) of the woreda four *tabias* were randomly selected using simple random sampling technique. In the second stage, a total of 130 household heads were sampled randomly from the respective list of farmers in the selected four *tabias* using probability proportional to the size of the population of each *tabias* from which the sample households were to be drawn (see Table 1). The reason for using simple random sampling is that the households are almost homogenous with respect to socio economic and cultural aspects, besides the *tabias* are located in the same agro ecological zone. This method of sample selection gave each *tabia* and every household heads in each *tabia* a chance of being included in the sample. Therefore, the sample selection was free from bias.

Table 4: Distribution of sampled households in the study area

Tabia list	Total No of households	%	No of Sampled HHs
Aditsahafi	955	18.5	24
Durra	882	17.7	23
Hatsebo	1638	31.5	41
Mahibereselam	1683	32.3	42

Source: Own survey result, 2012

Secondary data about the physical, socio-economic and demographic variables of the Woreda were gathered from the Agricultural and Rural Development Office of the Woreda, BoFED, TEPLUAA and NMA. Additional information about climate condition, adaptation options and farmers' perception were gathered from journals and books.

Semi-structured interview schedule was used to collect primary data from the sampled households about the socio-economic characteristics and institutional factors of the household. To collect all the information both formal and informal methods were employed.

To facilitate the data collection process the interview schedule was developed, pre-tested, and finally suitable modification was made by administering on non-sampled farmers. The interview was conducted by locally recruited and trained enumerators under the close follow up of the researcher in the months of February.

2.3. Methods of Data Analysis

Qualitative data obtained from interview and group discussion and the review of documents were compiled, organized, summarized and interpreted through concepts and opinions. In order to describe the explanatory variables on Farmers' perception, mean, standard deviation, frequency of occurrences, cross-tabulation and percentage were computed independently for each category.

3. RESULTS AND DISCUSSION

3.1. Farmers' Perceptions to Climate Change and Variability

In order to get essential information and insight into farmers' perception of climate change and variability looking at their perception on each parameter/indicators are quite important. Hence, knowledge of farmers' evaluative perception on climate change and variability attributes in the study area is an appropriate issue to be discussed. This section aimed at examining farmers' perception of climate (temperature and precipitation) change and variability attributes. For this purpose, two known climate conditions: temperature and precipitation have been used. Parameters such as annual precipitation, intensity of rainfall event, and length of dry spell from precipitation and annual average temperature, rainy season temperature, and length of hot period from temperature were used to assess farmers' perception on climate change.

3.1.1. Perceptions of changes in climate and meteorological station recorded data

To assess farmers' perceptions of climate change and variability, we first look at how climate data recorded at meteorological stations evolved (trends and variability) and how farmers perceived these changes. Tests were undertaken for linear trend in annual means of temperature, and total annual rainfall at local level. Descriptive statistics are used to provide insights into farmers' perceptions of climate change and variability. In the literature several studies have undergone the same type of analysis. Lack of long term and/or continuous meteorological record at local level, however, makes detailed analysis of farmers' perceptions of climate change and variability difficult.

A. Perception of temperature changes

Most of the farmers interviewed perceived long-term changes in temperature. About 95.4 percent of them perceive the temperature in their area to be increasing. No one noticed the contrary, a decrease in temperature; whereas 4.6 percent have not noticed any changes in the temperature (Table 3). The statistical record of temperature data from the Axum area between 1992 and 2009 (Appendix Table IV) also shows an increasing trend. The regression between average annual temperature and time shows an increase in one year time, results increase the average temperature of the area by 0.034 degree Celsius (Figure 3). Thus, farmers' perceptions appear to be in accordance with the statistical record of their area.

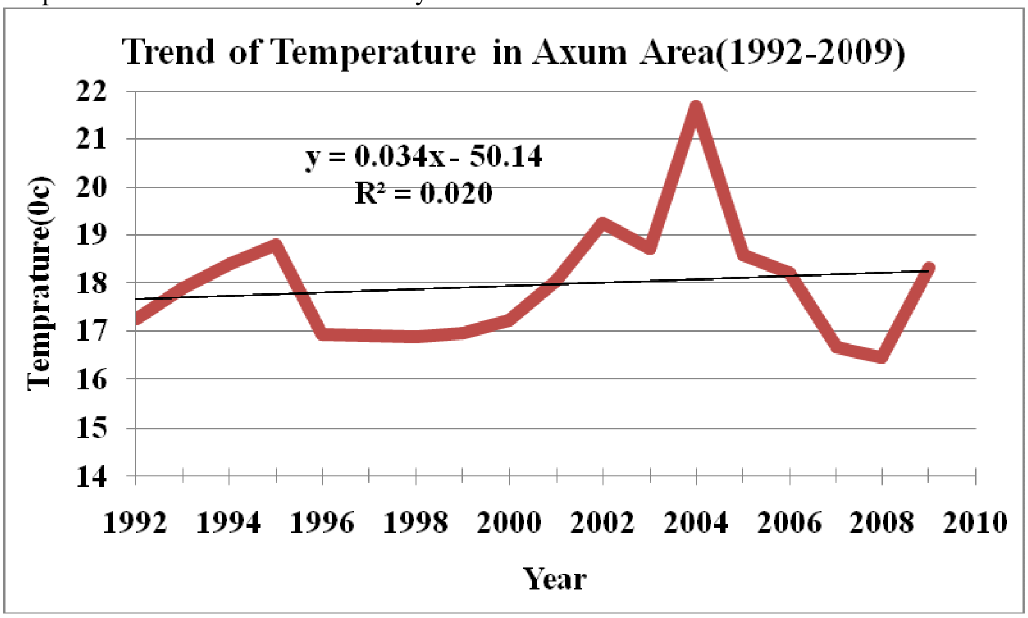
Table 3: Perceptions of temperature change parameters during the last 20 years

Percent of 130 households		Increase	Remain the same	Decrease
Temperature	Average annual temperature	95.4	4.6	0.0
	Rainy season temperature	65.4	27.7	6.9
	Length of hot period	79.2	20.8	0.0

Source: Own survey result, 2012

With regards to the rainy season temperature about 65.4% of the respondents perceive that rainy season temperature have increased, while about 36% of the respondents have the perception that rainy season temperature has remained the same, and only 6.9% of the respondents have the perception that rainy season temperature has decreased in the last 20 years (Table 3).

It is also apparent from Table 3 that from the total sampled farmers about 79.2% of them perceive increase in length of hot period in the last 20 years; whereas, 20.8% of them have the perception that there is no change in length of hot period in the last 20 years. No one of the respondents have the perception that length of hot period has decreased in the last 20 years.



Source: Data from National Meteorological Agency

Figure 2: Trend of temperature in Axum area from 1992-2009

B. Perception of precipitation changes

Ninety percent of the respondents observed changes in rainfall patterns over the past 20 years, and 86.2 percent noticed a decrease in the amount of rainfall. Almost 10 percent of the respondents noticed a change not in the total amount of rainfall, but in the timing of the rains, with rains coming either earlier or later than expected. High variability in the timing of rains was mentioned by all farmers in the study area. Besides, they noticed that the summer is coming late and is also shorter. Of the total respondents only 10% noticed that the amount of rainfall is enough to support their crop production, while the rest (90%) noticed the contrary, the existing amount of rainfall is not enough to support their crop production.

With regards to dry season precipitation, of the total sampled farmers about 75.4% of them perceived decrease in dry season precipitation in the last 20 years; whereas, 13.1% of them have the perception that there is no change in dry season precipitation in the last 20 years. Of the total sampled respondents about 11.5% have the perception of decrease in dry season precipitation in the last 20 years (Table 4).

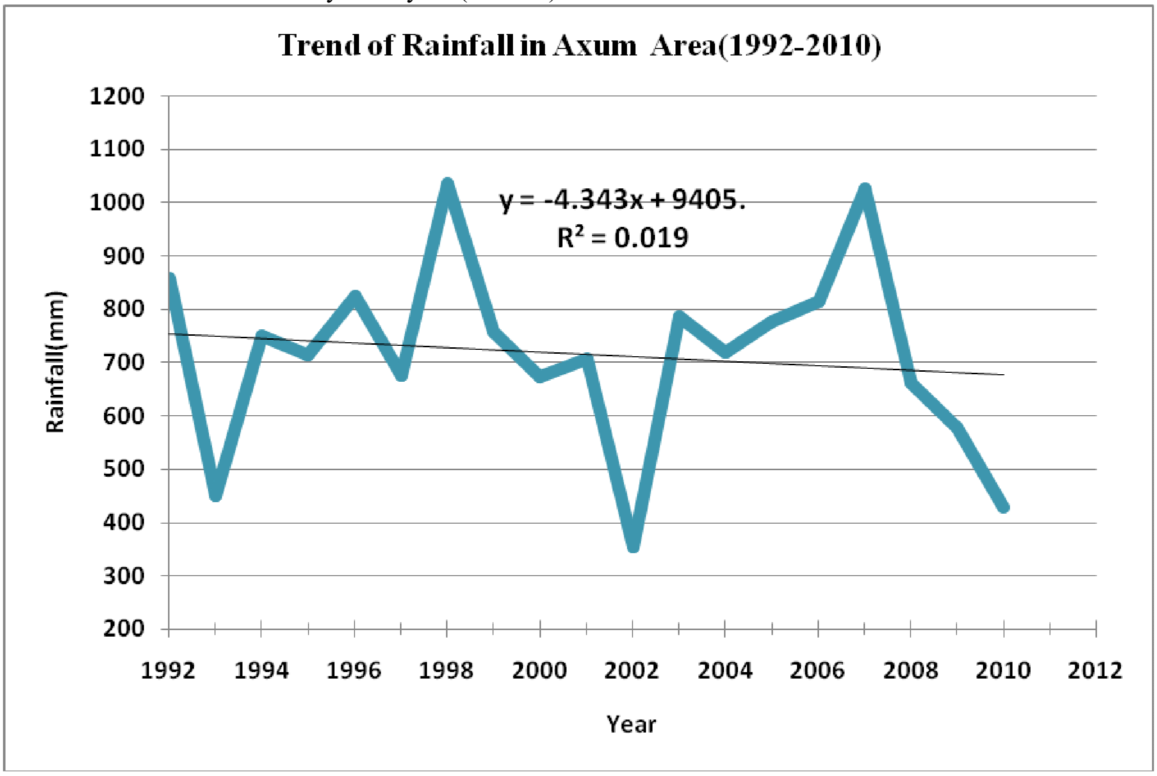
Table 4: Perceptions of rainfall parameters during the last 20 years

Percent of 130 households		Increase	Remain the same	Decrease
Precipitation	Annual rainfall	3.8	10.0	86.2
	Length of dry spell	63.8	18.5	17.7
	Intensity of rain fall event	27.7	20.0	52.3
	dry season precipitation	11.5	13.1	75.4

Source: Own survey result, 2012

With regards to the intensity of rainfall event about 52.3.4% of the respondents perceive that intensity of rainfall event has decreased, while about 20% of the respondents have the perception that intensity of rainfall event has remained the same, and 27.7% of the respondents have the perception that intensity of rainfall event has increased in the last 20 years. From the total sampled household heads about 63.8%, 18.5% and 17.7% of them have the perception increase, remained the same, and decrease the length of dry spell during rainy season respectively (Table 4). The possible reasons for variations in perception of farmers about the different indicators of climate change could be lack of formal climate information and experience difference among farmers.

The recorded data on rainfall from 1992 to 2010 in Axum area show that about 71 % (510.9 mm) of the rainfall occurs during summer months (June, July and August) (Appendix V). The data from the meteorological station of the study area also show a decreasing trend in the annual amount of rainfall. The regression between rainfall and time shows an increase in one year time, results in the reduction of the amount of annual rainfall by 4.343 mm (Figure 4). Moreover, there is a large variability (standard deviation of 176 .82 mm) in the amount of rainfall from year to year (Table 5).



Source: Data from National Meteorological Agency

Figure 3: Trend of rainfall in Axum area from 1992-2010

Local perceptions by farmers with respect to changes in temperature as well as increasing rainfall variability are closely related to empirical analysis of rainfall and temperature trends using the data obtained from meteorological station. Trend analysis of rainfall data (Figure 4) indicated that annual rainfall decreased from 1992 to 2010, more pronounced variability being observed from 1997 onwards. The observations under similar climatic conditions are in broad agreement with those reported by Deressa *et al*. (2008).

Table 5: Descriptive statistics of rainfall and temperature from 1992-2010

Description	Rainfall (mm)	Temperature (^{0}C)
Mean	715.2	17.95
Standard deviation	176.82	1.26
Minimum	354.6	16.46
Maximum	1037.0	2169
Trend (per year)	-4.343	0.034

Source: Computed from the National Meteorological Agency (NMA) data, 2010

3.1.2. Extreme climate conditions in La'ilay Maichew woreda

Participants of the group discussion have a very clear memory of the years dominated by extreme climatic conditions and other significant events leading to disturbances of the production (Table 6). Though the extent of feeling the impact varies, the frequently experienced climatic shocks are prolonged drought and delay in the onset of rain, erratic and low precipitation, and heavy and unseasonal rainfalls. The relatively major drought and rain delay events that hit the woreda and marked in the minds of participants in the group discussion are 1959 (locust invasion), 1969 (drought), 1971 (failed rainfall), 1975 (intensive and short time rainfall), 1984 (severe drought), 2002 (complete rain failure), and most recently 2010 and 2015 (low precipitation). In some cases, the same years are characterized by both excessive rains and drought. In the group discussion in general there was agreement on the overall increasing temperature and downward trend of precipitation. The perception of climate parameters (temperature and precipitation) of male and female participants was similar.

Table 6: Years of extreme climate conditions La'ilay Maichew woreda: Comparison of local observations based on group interviews and official records

Observations by local people	Official records of annual average rainfall
1959: locust invasion	- No data
1969: drought	476.2 is a below average rainfall year
1971: severe drought	396.2 is a below average rainfall year
1975: intensive rain(water logging)	- No data
1984: severe drought	- No data
1990: severe drought	- No data
1993: intensive rain at beginning then completely failure of rainfall	451.0 is a below average rainfall year
2002: drought	354.6 is a below average rainfall year
2010: drought(shortage of rainfall)	427.8 is a below average rainfall year
2010: drought(shortage of rainfall)	-is a below average rainfall year

Source: Own survey result and NMA, 2015

4. Conclusions

The study has been able to establish that rainfall and temperature in study area has been decreasing and increasing respectively. The statistical analysis of temperature data from 1992 to 2009 in the woreda shows a trend of increasing around 0.034 degree Celsius per year. Rainfall is characterized by large inter-annual variability with a substantial decrease in the amount of rainfall (4.4 mm per year) over the last 20 years of the data.

Farmers' perceptions of climatic change and variability are in line with climatic data records. Although majority of farmers in La'ilay Maichew woreda are able to recognize that temperatures have increased and there has been a reduction in the volume of rainfall, still few farmers have no the perception of change in climatic condition of their area to take steps to adjust their farming activities. Only approximately 86.2 percent of farmers are well aware of climatic changes and adjusted their farming practices to account for the impacts of climate change. The descriptive statistics analysis result shows that farmers with higher age (with more experience), large family or large economic active family member, holding large tropical livestock unit, having smaller distance to market and households with higher farm income are likely to perceive changes in the climate in the study area.

5. Recommendations

According to the results of this study, majority of the farmers are well aware of climatic changes, the perception of climate change is already high. Still, however, considerable number of farmers has no perception of climate change that has already changed over the course of their working lives, which indicates that, further effort is required by agricultural development actors to raise farmers' awareness about the existing change conditions of climate resources. Hence, there is a need to popularize the reality throughout the community by strengthening farmers' awareness on the existing changing conditions and its adverse impacts on their livelihood strategies. Therefore, increasing farmers' access to extension services is of great need in La'ilay Maichew woreda.

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Appendix I. Monthly average temperature of Axum area

	National Meteorological Agency											
	Station:-Axum Element :- Average Temp.(0C)											
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1992	#DIV/0!	#DIV/0!	22.29375	21.78086	21.95	22.11333	18.65323	17.62097	17.735	17.78387	17.15333	17.24839
1993	17.33065	17.38393	19.68548	19.78	20.73387	20.35833	18.46774	#DIV/0!	18.99167	18.75806	18.475	17.9
1994	18.27903	19.22857	20.56613	21.46167	22.20323	20.49167	18.12258	18.0129	17.49	18.30774	18.77833	18.39032
1995	19.09355	20.07857	20.96452	22.33667	21.85161	22.39333	20.37581	19.82742	19.2895	18.05323	18.59667	18.78871
1996	18.43065	19.31724	20.90968	19.25	19.81774	19.375	18.65645	18.94839	18.435	#DIV/0!	19.06	16.92419
1997	17.01452	17.35179	19.53226	18.59	19.82581	18.75667	16.41667	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1998	#DIV/0!	18.38727	18.64677	20.805	21.67742	22.005	20.16613	18.95323	20.015	18.77903	18.01167	16.88548
1999	16.85806	17.86071	19.02903	21.42167	21.96935	21.88333	18.09333	19.57258	19.04183	19.21452	16.375	16.96129
2000	17.40161	18.78103	19.99032	19.42833	19.43871	20.96	19.08548	18.46129	18.62	18.7629	18.56333	17.21774
2001	17.85645	18.78036	20.49194	21.75	22.2129	20.66167	20.21935	19.84516	19.625	19.75645	19.325	18.05645
2002	18.56774	20.64464	21.58548	21.99333	22.61613	22.20333	20.45806	19.22581	19.58	19.75645	20.46	19.24516
2003	18.25161	20.7375	22.27097	21.82	21.18387	21.41661	19.96935	21.16774	21.31667	20.44194	19.185	18.71774
2004	19.24677	19.3069	19.5375	22.075	22.80645	21.11	12.25495	20.65161	19.80333	19.99516	19.10333	21.69032
2005	17.52258	19.54821	20.4629	21.16333	21.26935	20.58667	20.08065	20.57742	20.235	19.69194	18.86167	18.57258
2006	18.87419	19.82679	20.19194	20.61667	20.34032	20.24333	19.37903	18.79355	18.63833	19.15645	18.52667	18.20161
2007	18.68065	19.2375	20.05	20.05167	20.85323	21.05667	19.15968	20.31935	19.26833	18.10161	18.15333	16.66774
2008	18.18387	18.33966	18.92419	19.83333	20.57419	19.72333	18.94516	18.63871	17.43	17.50484	16.37667	16.45806
2009	17.13387	18.8375	21.40484	20.09333	21.89516	21.825	19.02903	18.69516	18.59833	18.40968	18.80466	18.32581
2010	17.49194	18.88571	19.87742	19.96	20.31129	19.58	19.80484	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Appendix V. Monthly average rainfall amount of Axum area

	National Meteorological Agency												
	Station:-Axum												
	Element:-Average Rainfall												
Year	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Average RF(mm)*
1992	*0.0*	*0.0*	*0.0*	*14.9*	*19.5*	*57.4*	*176.5*	*427.4*	*77.6*	*23.7*	*57.3*	*3.9*	*858.2*
1993	*4.9*	*4.6*	*42.2*	*83.1*	*42.8*	*74.6*	*122.3*	*0.0*	*36.8*	*39.9*	*0.0*	*0.0*	*451.2*
1994	*0.0*	*3.2*	*0.0*	*8.4*	*23.3*	*166.6*	*215.6*	*284.7*	*46.6*	*2.4*	*0.0*	*0.0*	*750.8*
1995	*0.0*	*0.0*	*29.2*	*33.9*	*67.5*	*33.8*	*328.0*	*130.8*	*87.7*	*2.6*	*0.0*	*0.0*	*713.5*
1996	*0.0*	*0.0*	*73.7*	*56.5*	*146.1*	*56.4*	*168.5*	*219.9*	*30.5*	*0.0*	*72.6*	*0.0*	*824.2*
1997	*0.0*	*0.0*	*21.8*	*8.9*	*122.2*	*111.0*	*90.8*	*103.7*	*42.8*	*147.1*	*26.9*	*0.0*	*675.2*
1998	*0.0*	*0.0*	*6.7*	*33.2*	*85.0*	*76.6*	*372.1*	*356.1*	*83.6*	*23.7*	*0.0*	*0.0*	*1037.0*
1999	*40.3*	*0.0*	*0.0*	*20.7*	*10.2*	*42.1*	*278.4*	*219.5*	*52.3*	*92.0*	*0.0*	*2.0*	*757.5*
2000	*0.0*	*0.0*	*2.0*	*66.5*	*11.4*	*13.6*	*162.8*	*139.1*	*100.4*	*160.5*	*16.8*	*0.0*	*673.1*
2001	*0.0*	*0.0*	*1.5*	*6.4*	*15.9*	*74.0*	*212.1*	*355.6*	*25.8*	*14.5*	*0.0*	*0.0*	*705.8*
2002	*0.0*	*8.8*	*10.0*	*15.3*	*9.2*	*31.1*	*102.3*	*96.5*	*50.6*	*1.3*	*1.8*	*27.7*	*354.6*
2003	*2.5*	*8.5*	*2.4*	*8.3*	*12.2*	*126.1*	*322.7*	*209.1*	*89.6*	*1.4*	*3.7*	*0.0*	*786.5*
2004	*18.2*	*3.8*	*3.9*	*41.0*	*0.0*	*132.4*	*269.9*	*173.6*	*16.8*	*24.4*	*34.8*	*0.0*	*718.8*
2005	*0.0*	*0.0*	*129.7*	*86.0*	*5.1*	*85.4*	*176.6*	*226.0*	*67.2*	*0.0*	*0.0*	*0.0*	*776.0*
2006	*0.0*	*0.0*	*0.0*	*31.1*	*61.0*	*86.5*	*230.7*	*240.6*	*123.9*	*9.5*	*0.0*	*30.5*	*813.8*
2007	*0.0*	*0.0*	*7.0*	*10.9*	*35.5*	*112.6*	*428.1*	*272.8*	*154.3*	*0.0*	*6.1*	*0.0*	*1027.3*
2008	*38.5*	*0.0*	*0.0*	*85.2*	*41.3*	*102.3*	*161.8*	*174.7*	*49.9*	*1.5*	*6.8*	*0.0*	*662.0*
2009	*0.0*	*0.0*	*0.9*	*6.0*	*8.6*	*35.6*	*231.9*	*288.6*	*1.8*	*0.0*	*2.9*	*0.0*	*576.3*
2010	*1.2*	*0.0*	*54.2*	*36.3*	*17.3*	*109.4*	*209.4*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*427.8*