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Local farmers' level of perceptions and awareness's on climate change in Amaro ward, Ethiopia

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ABSTRACT: The study assessed the level of perception, awareness and information of households to climate change in Amaro ward, Ethiopia. Two villages were purposively selected from the 34 homogeneous villages that make up the Amaro ward. During the survey, one hundred households were interviewed using multistage technique. Descriptive statistics was applied to analyze the level of information and awareness of rural households on climate change. Weighted Average Score was used to analyze the perception level of respondent's in the area. Community leaders, head of the ward agricultural office, extension experts, elders and model farmers in the ward were part of the focus group discussion. Data from the focus group discussions complemented the survey results. Descriptive statistics revealed that most (80 and 79%) of households reported that climate has been changing and the change is reflected in terms of temperature and rainfall respectively. The analysis further investigated that majority (77%) of respondents had good awareness on climate change while 68% of them sourced about climate change from community leaders. Weighted Average Score revealed that majority (69%) of the respondents perceived that climate has been changing over the last 20 years in the area. These findings indicate that there is need to enhance farmers' access to climate data and other climate change information, awareness level of respondents shall reach to the satisfactory level to correctly interpret their perception of climate change.

Keywords: Amaro ward, awareness, climate, Ethiopia, perception.

INTRODUCTION

Climate change is the most persistent challenge confronting the world today (IPCC, 2007). Continuous increase in greenhouse gas emissions causes global warming. As a result, it leads to melting of glaciers, unpredictable rainfall patterns, and extreme weather conditions that could have a negative effect on global food security (Ojuederie and Ogunsola, 2017). The burden of these adverse effects of climate change is mainly bear on poor and low income communities because they have much higher levels of vulnerability coupled with low adaptive capacity to climate change (Burke and Lobell, 2010).

Climate change is widely recognized as the most significant environmental threat of the 21st century and it has affected agricultural production significantly (Ojuederie and Ogunsola, 2017). Projections about 2050 suggest both an increase in global mean temperatures and increased weather variability, with implications for the type and distribution of agricultural production and food security worldwide (Edame et al. 2011). The impacts of climate change will probably increase hunger and hinder poverty reduction strategies in most African countries, South and Southeast Asia and South Pacific region (Hirsch and Lottje, 2009).

Africa, particularly Sub-Saharan Africa (SSA), is the most vulnerable region to climate change because of its high poverty level, unequal distribution of property, reliance on rain-fed agriculture and very low awareness

level to climate change (Kotir, 2011). These factors have severe implications on household food security by decreasing the productivity of natural resources encompassing land, forest and water resources (IPCC, 2001). Nevertheless, there are vociferous climate change sceptics who still question the severity of climate change and argued against the need to combat it because of their low level of awareness on the effect of climate change (Oxford Committee for Famine Relife, 2017).

Ethiopia is so vulnerable to weather-related shocks because 80 percent of its population rely on climate change sensitive agriculture for their livelihoods and the rainfall pattern is unpredictable and variable throughout the regions (World Bank, 2010).

Previous empirical studies in Ethiopia indicate that education level of household heads, the household size, the gender of household heads, whether livestock were owned, the use of extension services on crop and livestock production were important factors that significantly affected the household's awareness to climate change. It is indicated that farmers perceived rainfall variability, declining hydrology and increasing temperature as manifestations of climate change, and prescribed emissions reduction and forest protection as its key solutions (Deressa et al., 2011; Aberra, 2011). A recent study by Baya et al. (2019) pointed out that climate change poses an increasing risk to the agricultural sector and the dynamics that underpin food security in Amaro ward, Ethiopia. Enhancing access to climate change data and updated information by recognizing farmer's traditional adaptation strategies would help the local government to design climate change policies which will improve the food security status of the households in Ethiopia and in Amaro ward in particular.

It may be believed that the first step toward high perception to climate change is awareness. It is also believed that community awareness and understanding on climate change constitute essential background to deal with climate change and related problems (Al Buloshi and Ramadan, 2015). In seeking to evolve updated information and awareness to climate change, it would be overbearing to ascertain the level of climate change awareness among households in Amaro ward. Thus, the following research questions are posed:

1. What are the elements of climate that has changed over the last 20 years in Amaro ward?
2. How aware are Amaro ward farmers about climate change and its impacts?
3. What do Amaro ward farmers get information on climate change?
4. What is the level of household perception to climate change over the past 20 years in the study area?

A cursory look at the previous studies on the level of household's perception and awareness to climate change in Ethiopia reveals that little research has been conducted in relation to the perception and awareness of households to climate change at national level. Some of the studies focused on adaptation to climate change and some others dealt with coping strategies to climate change but only few of them attempted to identify the perception and awareness level of households to climate change. More importantly, there is a dearth of research work in household's perception to climate change on food security in Amaro ward. A lot remains unknown about the perception and awareness of climate change at the sub-national stratum. This research was informed by the need to fill this important gap in knowledge.

RESEARCH METHODS

Study area

Amaro ward (otherwise woreda in Amharic language) is located at about 468 km from Addis Ababa and 207 km south from regional city of Hawassa (FDRE, 2011). This ward is situated between latitudes 5^0 40' and 6^0 0' north of the equator and longitudes 37^0 40' and 38^0 0' east (Figure 1). The ward has a total population of 167,379 of which 84,411 (50.4%) are males and 82,968 (49.6%) are females. There are 7,990 households in the sample villages and most of the population (75%) is engaged in mixed farming systems (CSA, 2010). Majority (94.2%) of the people are rural dwellers and their livelihoods revolve around small scale, rain-fed rural agriculture while about 5.8% of the people are engaged in non-agriculture related activities. The area has different agro ecological zones, ranging from lowland to highland (Baya et al., 2019). These agro-ecological zones make it possible to grow different crop types but the changing climate threatens productivity in the area (AWADO, 2010). The ward receives an average annual rainfall ranging from 800 to 1000 mm and temperature ranging from 12.6 to 25°C. The ward has two main seasons (summer and winter) where different crops such as fruits, enset, vegetables, cereal crops, coffee, root crops, oil seeds and others are grown at low level of production due to erratic rainfall (AWADO, 2010).

Sampling and data collection

The study used multi-stage sampling techniques to select the study area and sample respondents. Amaro ward was purposely selected from the five wards of Segen People Zone of Ethiopia because the ward is highly productive area yet agricultural production is below the expected amount because of the very poor awareness and perception of households to climate change (AWADO, 2010). Of the total 34 villages in Amaro ward, two villages

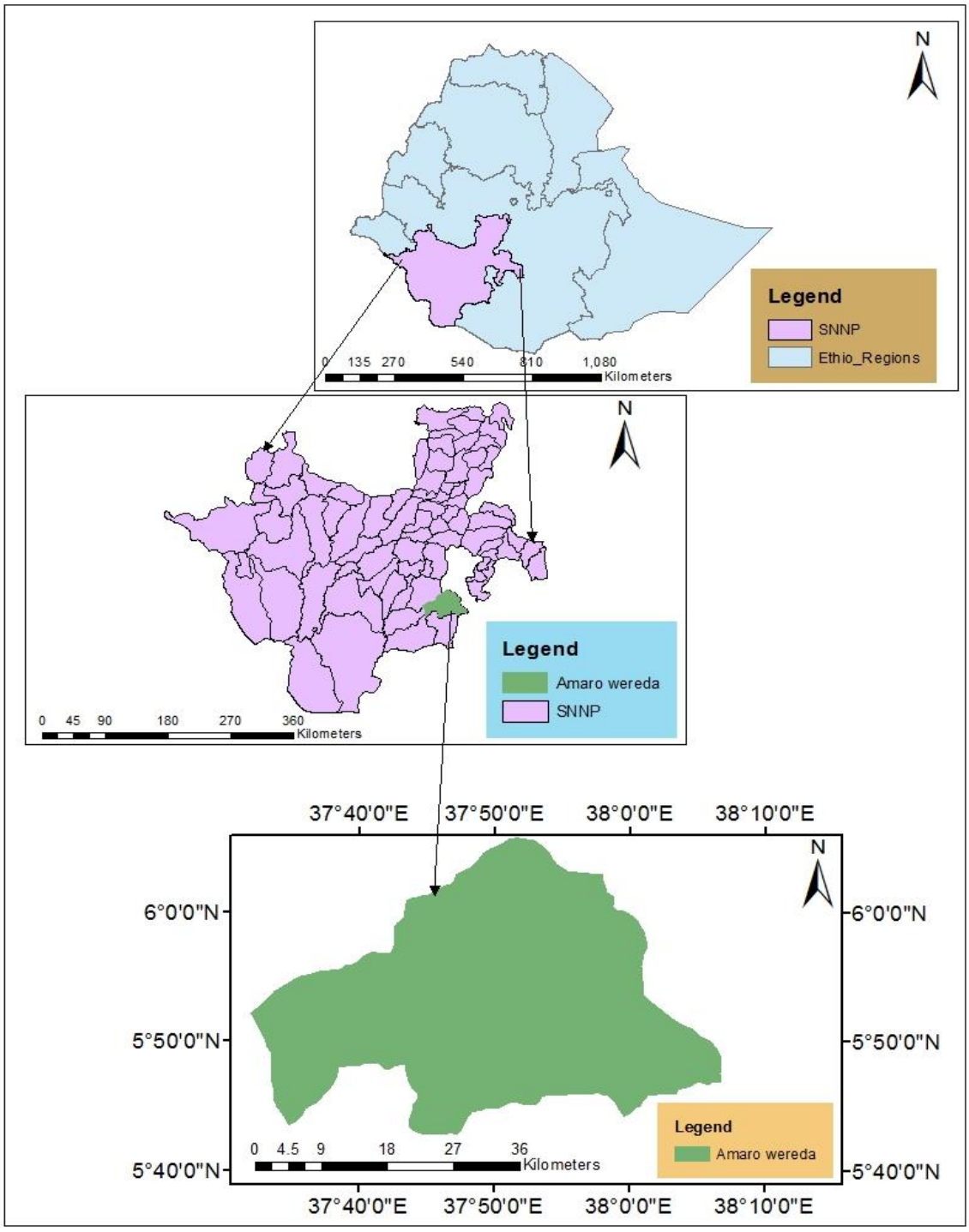

Figure 1. Administrative map of the study district (Amaro ward).
Source: Ethio ArcGIS (2018).

were selected: Dayketa from the highland and Suluko from the lowland. Stratified sampling technique was used to identify male and female households in the area and systematic random sampling was used to select proportional respondents from lowland (Suluko village) and highland (Dayketa village) agro ecological zones for making a total of 100 households (household head is a sample respondent). Primary data were collected from the

100 households using structured interview triangulated with data collected from focus group discussions. Community leaders, head of the ward agricultural office, extension experts, elders and model farmers in the ward were part of the focus group discussion. On the other hand, the secondary data were retrieved from relevant publications such as journals, conference proceedings, thesis and project reports (Baya et al. 2019).

To determine the appropriate sample size, the following formula was used.

$N = N/1+N(e^2)$ ……. (1) (Yamane 1967)

Where: n is the number of sample size from the population; N is the total number of household heads in study area = 7990; e is degree of precision at 90% confidence interval in this study i.e. e = 10%.

The distributions of the total sample in sample villages were based on the probability proportional to the number of food insecure household in two villages. This gave a sample size of 100, 7990/1+7990 (0.01) =100.

Focus group discussion (FGD)

The purpose of FGD is to triangulate the data that was collected by using structured interview to enrich the reliability and validity of the data. The data that was collected from FGD was analysed by using narrative analysis to enrich qualitative conclusions. Mixed gender (male and female) participants with varied bio-data profile and good climate change knowledge were selected to participate in the FGD. Each of the FGD sessions comprised six (6) discussants. Purposive sampling was used to select knowledgeable and experienced discussants and criteria for selection were knowledge of the subject by involvement in farming activities for a long period of time, work experience in government and non-government organizations in the areas of climate change and food security/crop production and willingness to participate in FGD.

During FGDs, phone recorder was used with the permission of the discussants for later transcription. Three (3) FGD sessions were conducted:

1. FGD for government officials from Amaro ward Rural Development and Agricultural Extension Office.
2. FGD for model farmers from each village.
3. FGD for village chairmen and cultural leaders. Each discussion group were made up of 6 discussants (4 males and 2 females) giving a total of 18 discussants.

Data analyses

Data were collected using structured interviews which were coded and processed using SPSS software version 20 for further analysis. Simple descriptive statistics such as frequency and percentage were used to identify household's source of information and awareness to climate change in the area. Weighted Average Score (WAS) was used to investigate 20 years' perception of households on climate change. A weighted score is calculated by determining all the variables and their respective values by using frequencies. To arrive at a weighted score, values were assigned to each of the variables and multiplied by the corresponding numerals. The results were tallied and divided by the sum of all of the original values to yield the weighted average. In this study, it was used to identify the degree of agreement of households in Amaro ward about their perception to climate change. A total of 10 statements were used in the questionnaire to ascertain how households with their perception to climate change agreed. The responses to the statements were ranked on 4-point Likert Scale ranging from often to never. Thus, the coding of Likert Scale was graded 4, 3, 2 and 1, respectively. The data generated were subjected to WAS analysis. The threshold value to establish the agreement degree was derived by summing up the grades and dividing the total by the number of ranks possessed by the Likert Scale which is 4. Therefore, the result becomes (4+3+2+1)/4=2.5. This implies that any statement with a WAS of less than <2.5 for perception to climate change indicates low degree of perception while any statement ≥2.5 indicates high degree of perception. Descriptive statistics such as percentage, frequency and mean were used for further analysis. Narrative analysis was also used to analyse qualitative type of data collected from focus group discussion to enrich and illustrate qualitative conclusion.

RESULTS AND DISCUSSION

Sex distribution of respondents

Sex factor is a determinant of household activities especially in the rural areas. Figure 2 shows that 74% of the respondents are male and 26% are female. The greater number of males among the respondents does not necessarily mean that there are more males in Amaro ward than females. But the involvement of more males in this study is attributed to their greater engagement in agricultural activities which is primarily due to their easy access to land. Patriarchy is a strong characteristic of the Ethiopian society and culture. This system ensures that land is inherited mostly by males born in the family.

Educational level of respondents

According to Figure 3, 22% of the respondents have primary education, 18% have high school education; 5, 5

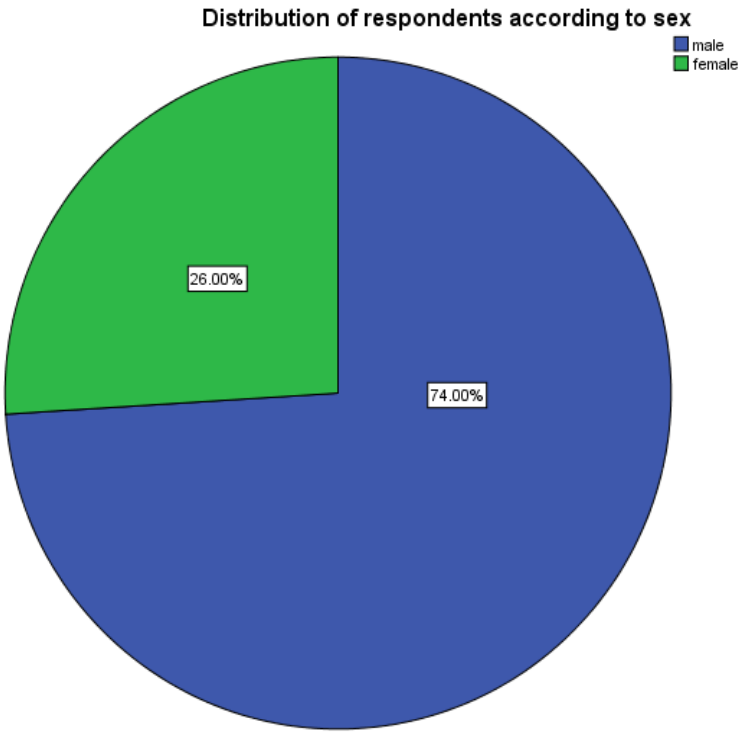

Figure 2. Distribution of respondents according to sex.

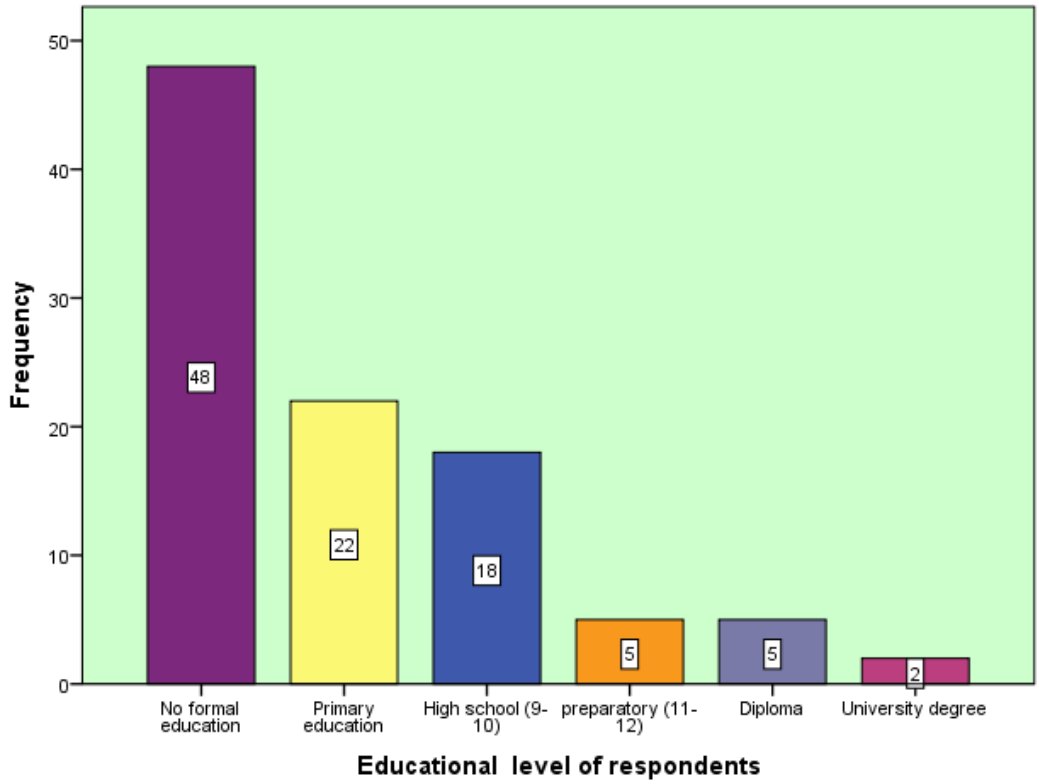

Figure 3. Distribution of respondents according to educational level.

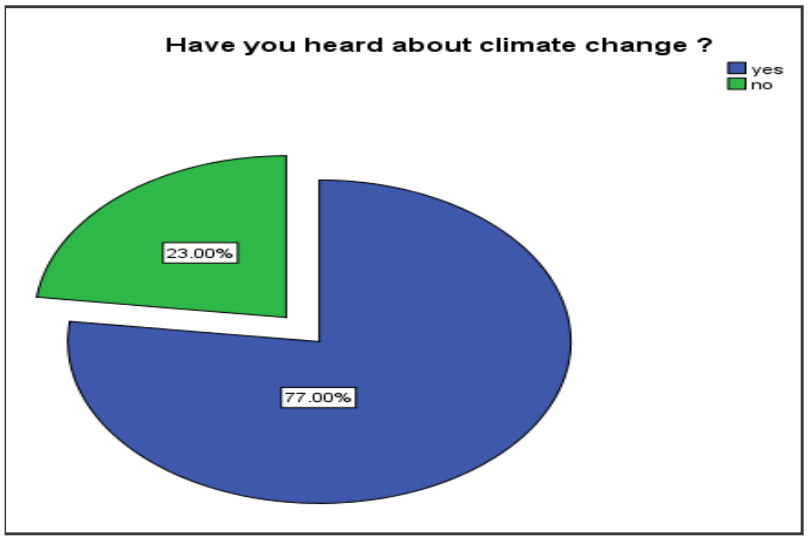

Figure 4. Awareness of respondents on climate change.

Table 1. Respondents source of information on climate change.

Source of information	Response (frequency)		Percentage (%)	Total
	Yes	No		
Television	42	58	100	100
Community leaders	68	32	100	100
Radio	65	35	100	100
Local government	33	67	100	100

and 2% have preparatory, diploma and degree respectively; while majority (48%) had no formal education. It is believed that education broadens the horizon of human activities, operation and understanding of his environment including climate change and farming activities.

Low education levels complicate the community struggles towards good awareness and perception to climate change; hence, making them susceptible to the hazards of climate change (Smit et al., 2001). Figure 3 shows that many (48%) of the respondents had no formal education in the study area. This indicates that reduced awareness and low perception to climate change in the area may be as a result of the low educational levels of the respondents. The educational deficiency of that significant number evidently affected the level of awareness and perception of households in the study area.

Household's awareness to climate change

From the results in Figure 4, it could be seen that 77% of the respondents reported that they have heard about climate change while 23% stated that they are not informed about climate change. Majority (77%) of the households in the study area have good awareness about climate change. But there is still a need for increase in the level of awareness of farmers and the general public on climate change issues. The people's ability to respond to climate change challenges is determined by the quality of the information available to them and how easily the information could be accessed. In agreement with the current study, Sugirtharan and Venuthasan (2012) pointed out that, 70 and 61% of the farmers are aware about the changing pattern and the increasing trend of flood and drought respectively. Likewise, Rupan et al. (2017) carried out a study indicated that all the farmers were found to be aware of the climate change, and majority of them reported erratic rainfall, diminishing agricultural yield and increase in temperature as indicators of climate change. These findings are in line with the current study where majority (77%) of the households had good awareness on climate change.

Source of information on climate change

Table 1 shows that 65 and 68% of the respondents obtained their information on climate change from the

Table 2. Elements of climate that have changed over the past 20 years.

Elements of climate change	Response (frequency) N=100		Percentage	Total
	Yes	No		
Rainfall pattern	79	21	100	100
Humidity	9	91	100	100
Temperature	80	20	100	100
Wind speed	8	92	100	100

Table 3. Households perception on climatic variables over a period of 20 years.

Statements	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	WAS	Sig.
There is less rainfall	0	17	52	31	3.14	*
There is very low temperature	51	17	19	13	1.94	
Intense rainfall	2	24	56	18	2.9	*
There is wind	21	41	28	10	2.27	
There is drastic drought	14	29	34	23	2.66	*
There is high temperature	5	38	38	19	2.7	*
Drastic change in humidity	3	27	48	22	2.89	*
Drastic change in temperature	2	18	54	26	3.04	*
There is recurrent flood	8	24	45	23	2.83	*
Prolonged rainfall	1	24	51	24	2.98	*
Overall Perception	**%**					
Climate is not changing	31					
Climate is changing	69					

Any statement with WAS ≥ 2.5 is deemed as significant.

radio and community leaders respectively. Other respondents stated that their sources of information are the local government (33%) and television (42%). Accordingly, majority of the households in Amaro ward have good awareness about climate change and its positive and negative effects on agricultural activities. Ethnographic interview revealed that this because the community leaders played a major role in climate change awareness in the study area. This result is in line with the views of Delaporte and Maurel (2015) and Giannini et al. (2017) who stated that households are not passive victims of climatic shocks. Rather, they react and adjust their farming practices depending on the level of information they have.

Households' perception on the elements of climate that has changed over the past 20 years

Table 2 shows that majority of the respondents,79 and 80%, reported that they observed climate change in terms of rainfall pattern and temperature respectively while 9 and 8% indicated that they observed change in climatic elements in terms of humidity and wind speed respectively. These results show that there is change in the rainfall pattern and temperature over the past 20 years in Amaro ward. This result highlights that smallholder farmers perceived that climate was indeed changing. Rainfall is continuously varying and getting erratic over time because of unpredictable climatic variability and change. Rainfall irregularity and uneven distribution during the main cropping season were the main factors affecting crop production in the study area. This is evidence that inadequate rainfall affects agriculture in the study area and in other similar agro-ecological zones of Ethiopia (Baya et al. 2019).

Level of household's perception on climatic elements and aspects

This part of analyses showed the level of household perception on climatic elements over a period of 20 years in the study area. Weighted Average Score (WAS) analysis was used to examine the responses relating to the degree of perception of households on climatic change. The results are as shown on Table 3. Many respondents (52%) agreed that less rainfall happens sometimes in the study area. The WAS of 3.14 indicates

that there is a high degree of agreement, based on this variable, climate is changing significantly. In the case of very low temperature, many of the respondents (51%) agreed that very low temperature have not been observed. The WAS of 1.94 indicates insignificant change considering this variable. Similarly, the WAS of 2.27 of "there is wind" which is less than 2.5 shows that this variable is insignificant in affecting climate change in the study area. All other issues (intense rainfall, drastic drought, high temperature, drastic change in humidity, drastic change in temperature, recurrent flood, prolonged rainfall) have WAS which are higher than 2.5, indicating that these variables have significant influence on climate change in the study area. From Table 3, it could be seen that "less rainfall" and "drastic change in temperature" are the most significant variables that influences climate change in the study area with WAS of 3.14 and 3.04 respectively.

Most farmers who had good perception to climate change still wanted local government support in providing extra awareness on climate change to increase their agricultural production. For instance, a participant in an FGD said that,

"Our land is fertile enough to produce and sustain food security for our community, the problem of low production is that we could not manage farming activities in line with the ever changing climate" (65-year-old male farmer in Dayketa village).

Index variable was employed to determine the overall perception level of respondents about climate change in the study area. There are 10 variables and the minimum score a respondent can get for all of them is 10 while the maximum score is 40. This is because the Likert Scale was coded from 1 score for "Rarely" to 4 for "Often". The index variable was constructed by finding the middle point between the minimum and the maximum scores, making 25 the middle point. In this case, any response from 10 to 25 was deemed as "climate is not changing" while any response from 25 to 40 was grouped as "climate is changing". Based on this, it was discovered that majority of the respondents (69%) agreed that climate is changing against 31% that did not. This result is in agreement with that of Sørhaug (2011), Weldegebriel and Prowse (2013) and Wondimagegn and Seifu (2016) who studied different parts of Ethiopia and found out that most households were aware of climate change patterns and their adverse effect on food security.

Conclusions and recommendations

The study assessed the perception and awareness of rural households to climate change in Amaro ward, Ethiopia. Climate change has resulted in increase in temperature and decrease in rainfall in the study area. Accordingly, majority (77%) of respondents have reported that they have had awareness on climate change while 68% of them noted that their source of information on climate change is community leaders. The analysis results also showed that majority (80%) of respondents for temperature and 79% for rainfall pattern have perceived changes over the last 20 years. Weighted Average Score analysis result has shown that the majority (69%) of respondents perceived the climate as changing whereas only 31% of respondents did not perceive the climate as changing during the past 20 years. The study further concludes that households in Amaro ward have good information, awareness and perceived changes in climate which is most likely interpreted changes in terms of temperature and rainfall.

Therefore, timely and quality information and advanced awareness on climate change will enhance the rural households' ability to adapt to climate change. Enhancing access to climate change data by specializing farmer's traditional adaptation strategies would help the local government to design climate change policies which will improve the food security and socioeconomic condition of the households.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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