



The Role of Local Institutions in Adaptation to Climate Change by Smallholder Farmers: the Case of Sodo Zuriya Woreda, Wolayta Zone, SNNPRS. Ethiopia.

Lukas Bezabih Kenta

Wolaita Zone Culture and Tourism Department, SNNPRS, Wolaita Soddo, Ethiopia.

Corresponding author: bezabihlukas@gmail.com

Abstract

Climate change is real and might affect all regions, countries and rural areas in some way. Smallholder farmers are most at risk to its impacts. Successful adaptation is therefore needed to increase their resilience to climate change. However, the capacity to adapt depends on specific institutional arrangements operating within the society. The main objective of this study was to measure the role of local institutions in adaptation to climate change by smallholder farmers on the ability to adapt to climate change. The study was used multistage sampling techniques for the survey. A household survey was conducted using 356 heads of households who were randomly selected. Face to face interviews were organized with 8 heads of institutions involved in smallholder farmer development project in the study Kebele's. Quantitative data from the field was subjected to statistical analysis such as binary logistic, multiple regressions and chi-squares tests and presented in the form of frequencies and percentages. According to the results three of the institutions were in existence and the smallholders were also confirmed that, there were climate changes in the areas. Besides, accessibility of farming households to local institutions have significant contribution for improvements of livelihood assets such as human, financial, natural, social and physical capitals at local level. Based on the findings, the study recommended that, institutions must develop innovative ways of spreading out their reach (such as outreach on market days) in order to aid farmer adaptation. In addition, the improvement of financial, natural and physical capitals of livelihood assets play remarkable role for promoting the welfare status of smallholders. Therefore, the local government bodies should work hard to improve the accessibility of all public institutions to meet the service needs of people that can change their livelihood.

Keywords: Adaptation, Climate change, Local institutions, Smallholder, Soddo Zuriya

Introduction

Climate change is real and happening now. It may affect all regions, countries and rural areas in some way [1]. The global temperature and rainfall have changed and changing rapidly over the last century due to anthropogenic increases of greenhouse gases (GHGs) in the atmosphere (burning of fossil fuels, like coal, petroleum and widespread deforestation [2, 3]. The Intergovernmental Panel on Climate Change (IPCC) report is certain that the earth's climate is changing and has shown with evidence in its fifth assessment report the impacts of climate change on specific geographical regions, sectors and systems globally [4]. The effects of climate change undeniably clear with impacts already affecting ecosystems, biodiversity and people [1]. In both developed and developing countries, climate impacts are echoing through the economy, from threatening water availability to sea-level rise and extreme weather impacts to coastal regions and tourism [1]. In some countries, climate impacts affect the ecosystem services that communities are largely dependent upon, threatening development and economic stability [1]. Future impacts are projected to worsen as the temperature continues to rise and as precipitation becomes more unpredictable (ibid).

Agriculture is recognized as the economic advantage of most developing countries though it is rain-fed and practiced on a smallholder non-mechanized basis in rural locations [5]. Smallholder farmers contribute about 80% of food needs in developing countries and use up a significant percentage of global land [5]. However, despite their large numbers and contribution to food security and economic needs, smallholder farmers are most at risk to climate change and its impacts (ibid). Their vulnerability results mainly from their dependence on the weather and their location in areas that are vulnerable to climate risks such as dry lands, marginal areas and low latitudes [5].

Climate induced impacts on the environment have been discovered to affect the sustainability of the livelihoods of people engaged in the natural

resource sector as it interacts with existing pressures on their livelihoods [6]. Effective steps to ensure successful adaptation is therefore needed to increase their resilience to climate change. Research by many individuals and research centers have proposed adaptation that leads to sustainable development as the key to improving Africa and poor countries resilience to climate change impacts [5]. Adaptation to climate change can be undertaken on different levels or can take different forms (ibid). These are on the individual level, national or international stages, either as a reactionary activity or a proactive reaction (ibid). From the studies conducted by Dessalegn and Akalu, 2015 [4], one comes to a realization that, although there may be some autonomous adaptation at farm-level, there needs to be some form of institutional intervention to make adaptation successful. IPCC, 2007 [1] postulate that social institutions, be they formal or informal, initiated externally or internally are important in the process of adaptation and therefore are important focal points in adaptation (Ibid).

For a century, rural communities have used a variety of adaptation and coping strategies to respond to environmental stresses [7]. However, several studies argue that many future climatic changes are beyond the past experiences of rural communities (Boka Gutu, 2017; Gortner *et al.*, 2007) [8, 7]; thus these strategies will not be sufficient in dealing with medium to long-term impacts of climate change. However, Agrawal, 2008 [9], posits, how institutions have affected rural residents response to environmental challenges in the past. According to Him, 2008 [10], local institutions remain the key actors that structure risks and people's sensitivity to climate hazards, facilitate individual and collective responses and shape the outcomes of such responses. Agrawal, 2008 [9], found particularly that support to smallholder farmers 'coping strategies through appropriate public policy and investment, and collective actions can help increase the adoption of adaptation measures that will reduce the negative consequences of predicted changes in future climate, with great

benefits to vulnerable smallholder farming communities.

Local institutions are claimed to be important in facilitating adaptation to climate change at local level as well as managing and implementing locally driven adaptation initiatives, creating opportunities for collective learning and by mediating interventions suitable to the local context [7, 9, 11, 12]. Throughout history, human societies have adapted to different changing climatic situations by employing different strategies [13]. However, the capacity of the human social systems ability to adapt depends on specific institutional arrangements operating within the society [9]. In countries where institutions are firm and working well, climate change adaptation is to a certain extent more successful as resources are made ready towards planned adaptation and this is true in the case of developed countries (ibid). In developing countries on the other hand, institutions are generally poorly developed and in some cases non-existent, thus reducing the capacity of local actors to adapt [13]. Similarly, Agrawal, 2008 [9], suggests that, adaptation in human systems is successful when governance institutions, civic and political rights literacy systems are working well and linked to the adaptation process.

However, few studies have carefully analyzed the relevant local institutions that intervene in climate change adaptation and, how they contribute to smallholder adaptation to climate change. Most of the previous studies focused on analyzing the livelihood adaptation strategies of farmers to climate change and variability [12, 14, 15, 16, 17, 18]. But still there is a limitation of study on the role of local institutions in climate change adaptation in Ethiopia, specifically in Wolayta zone.

Objectives of the study

General objective

The main objective of this study was to investigate the role of local institutions in adaptation to climate change by smallholder farmers in the study area.

Specific objectives

The study sought to achieve this broad objective through four specific objectives, namely by:

) Examining the role of institutions and the challenges they face in enhancing the ability of smallholder farmers to adapt to climate change in the study area.

) Assessing the challenges smallholder farmers face in accessing institutions

) Assessing the effect of access to local institutions on livelihood of farm household's.

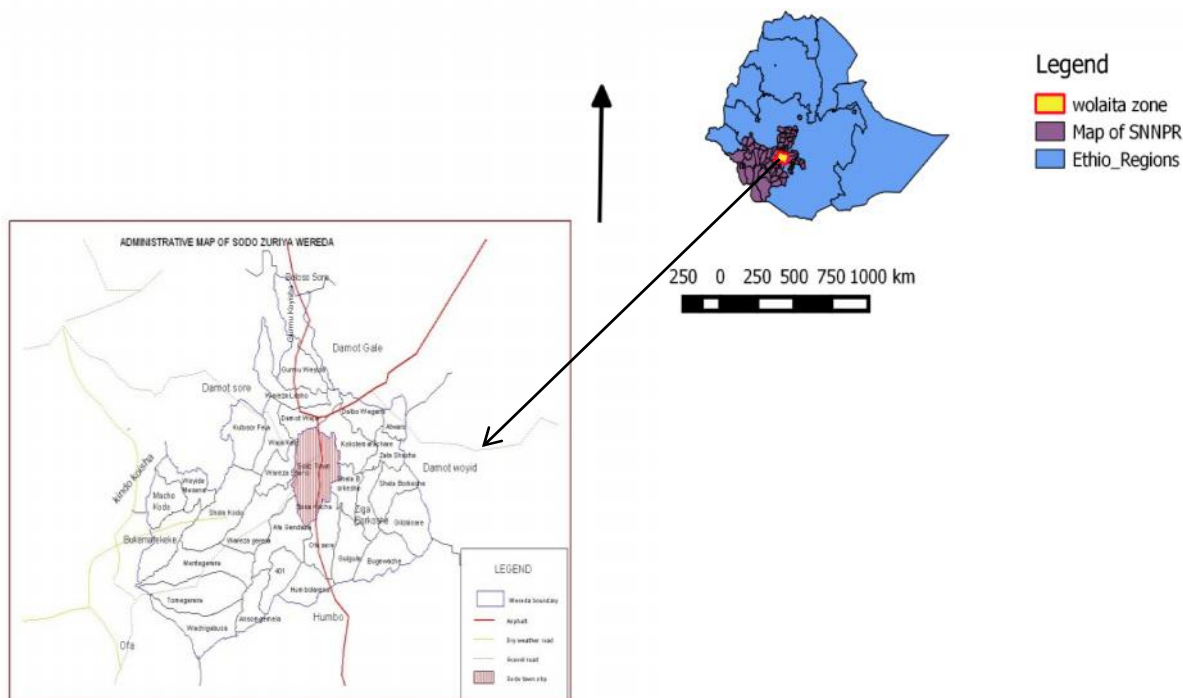
) Find out ways in which institutions and their linkages with smallholder farmers can be strengthened.

Materials and Methods

Description of the study area

Location: The study was conducted in Sodo Zuriya Woreda. Sodo Zuriya Woreda is one of the Woreda administrations in Wolayta Zone (Southern Nations Nationalities Peoples' Regional State). The Woreda is located at a distance of 360 km away from Addis Ababa; which is the capital city of Ethiopia. It is located at 6°51'03"N - 37°46' 7"E and 149.9 W direction at elevation of 2404 ma.s.l (Wolaita Zone Bureau of finance and economic development, 2018). Sodo Zuria is bordered in the southwest by Offa, in the west by Kindo Koyscha, in the northwest by Damot Sore, in the north by Sore, in the northeast by Damot Gale, in the east by Damot Weyde, and in the southeast by Humbo. Town of Sodo was separated from Sodo Woreda [19].

Figure 2: Map of the Study Area



Source: WZFED, 2018 [19]

Climate: The agro-ecology of the Woreda is dominated by midland that covers about 87% of the total area, and the remaining 13% is highland with rugged mountains and slopes [20, 21]. Damota Mountain is the highest peak (over 2800 m.a.s.l) in the Woreda and is considered as the main water source to the surrounding communities. All the highland Kebeles are located around the mountain. The altitude of the Woreda falls in the range of 1500 to 3200 m.a.s.l. The average annual rainfall of the Woreda is 1200 mm per annum, while the daily temperature varies from 15⁰C to 30⁰C (ibid).

Population and ethnography: The total population of the Woreda is 179,109 out of which 90,525 male and 83,246 female [19]. The population density in the Woreda is 528 persons per square kilometer [19]. Majority of the population resides in the rural areas and their livelihood mainly depends on subsistence agriculture. The five largest ethnic groups reported in Sodo Zuria Woreda were the Wolayta ethnicity (92.81%), the Amhara (2.6%), the Gamo (0.85%),

the Dorze (0.77%), and the Silte ethnic group (0.76%); all other ethnic groups made up 2.21% of the population. Wolayta is spoken as a first language by 93.14%, 4.17% Amharic, 0.65% Gamo, and 0.58% speak Dorze; the remaining 1.46% spoke all other primary languages reported [19].

Economic activities: The Woreda has totally 30 rural and 6 urban Kebele administrations. The total land coverage of the Woreda were 40,805 hectares, of which 12,269 Ha (35.75%) is allocated for crop production, 9,067 Ha (19%) for fallow land while 12019 Ha (30.61%) for grazing land and 7450 Ha (15.02%) for forest land [21, 22]. Soil types on the area are mostly clay and clay loam. There are two agricultural production seasons; *Badhdheesa / meher* (long rainy season) and *Balguwa /belg* (short rainy season). The *meher* rains start in June and extends up to mid-September, while the *Balguwa* rainy season lasts from March to May. The *balguwaa* season contributes the highest share to the annual crop production, and about 87% of the farmers operate in this season [21, 22].

Agriculture is the main source of livelihoods of the people. Besides the fragmented land holding, the small land holding (on average less than 0.5ha per farmer) determines the economy. However, the agricultural system is still traditional and is often characterized by low productivity. Farmers grow a variety of crops in the two seasons (ibid). Maize is the major food crop grown by all farmers as a main source for own consumption as well as for market. Haricot bean is often intercropped within maize field for own consumption and cash in the midland, while wheat and barley are the major crops grown in the highland area [23]. Irish and sweet potato, enset /false banana/, cassava, taro and other root crops are also grown. Root crops play an important role in filling the gap in household food requirement particularly during the lean season [22].

The rest of the community members (those who don't have farming land) are participating in daily labor work at nearby Sodo town, the Capital of Wolaita Zone. Some minor community groups are also involved in off-farm activities such as pottery, blacksmithing and making handcrafts (ibid). Thus, crop production is practiced even at slopes of more than 80%. Over-grazing and increased settlements caused by increasing population pressure have also aggravated the situation [21, 22].

Agricultural and Rural development office reports show that the total livestock population of the Woreda estimated to be 295, 687 [24]. There is not sufficient land available for free Grazing due to population density, the community uses stall feeding. The major livestock managed in the study area include cows, Oxen, sheep and goat, donkey and poultry. Mule and horses found in small number (ibid). Non-farm activities are the most important source of income for livelihood in the Woreda. Some *Kebele's* in the study area are nearer to most of small towns where farmers can engage in some sort of income generating activities such as petty trading and sale of labor [21].

There are 7 health centers and 39 health posts and 1 NGO clinic in the Woreda. Water supply covers

about 57% of the Woreda. The Woreda has 42 first cycles (grade 1-4), 31 second cycles (grade 5-8) primary schools, two secondary schools (grade 9-10). Sodo town and one rural Kebele which is bossa kacha obtain hydroelectric powers. All *Kebele's* have wireless telecommunication. There are markets (both output and input markets) in all Kebele's [20, 21, 22].

Study Methodology

Research design: In investigating the role of local institutions in adaptation to climate change, a qualitative case study approach was employed. Nicholas, 2011 [25], explain that the case study approach involves studying a specific unit(s) or case in details so as to explore their in-depth differences and complexities and come up with explanations that can be generalized for similar cases. This is because; the case study method allows researchers to retain the holistic and meaningful aspects of real- life events [26]. According to Nicholas, 2011 [25], case studies can be categorized into cross-sectional or longitudinal studies. A cross-sectional study refers to research done at one particular point in time while on the other hand a longitudinal study refers to research carried out multiple times for the same case leading to case examination over a long period. Although for this study the researcher visited the field twice, the second field visit was used to fill in gaps in data collected and not in re-examining previous acquired data. Therefore this is a cross-sectional case study where findings are limited to the period under which the study was done.

Sampling Technique: To achieve the objectives of the study, multistage sampling techniques were used. Multistage sampling is commonly used for household surveys in which all elements in a sampling population cannot be individually identified or when the population is scattered over a wider geographic region [27, 28]. In this type of sampling primary sample units are all-encompassing and secondary units are sub groups within these ultimate units to be selected which belong to one and only one group [29].

Target Population and sampling unit: The study was directed at smallholder farmers in Sodo Zuriya Woreda and institutions that offer adaptation intervention to them. Institutions in the area such as agriculture development offices, Damota Cooperative Union, Omo Micro finance institutions, Rural Community Based Development Initiative, Send a Cow, equib, iddirs and others which are working in the areas were targeted for the study. As mentioned out above, from the total of Woreda population 179,109 total household size is 35,921 of which 31,921 are rural household size whereas, 4,076 are urban household [19].

Sample Size: Totally, from 15 Woreda which are found in Wolayta Zone, Sodo Zuriya was selected as study area. The research site or Woreda was selected because of its nearness to the researcher regular working environment and for its cost effectiveness and/or for transport and communication accessibility as well as for the presence of NGO^s and researcher previous and current knowledge of the areas and access to get data. Multi stage sampling techniques were used to select sample household heads. The Woreda is divided in to 30 Kebele administrations. To select the HHH, First stratified sampling technique was used to stratify the study area in to different strata. The stratum was based on the availability or presence of local institutions in the study area. According to Sodo Zuriya Woreda agricultural offices and finances and economic development bureau, 2018 [19], institutionally the area was divided in to two, which is available and unavailable. Second from each institutionally available Kebele 3 were selected purposively. These are namely Dalbo Wogene, Waraza Lasho and Gulgula. Third, simple random sampling techniques were used to select sample household heads from each stratum. Based on this information from the total of 3208 HH of the three Kebele's, the study took the following sample size. The sample size was calculated based on Yamanes, 1967 [30], formula quoted by Gahuti, 2013 [31]. This is a simplified formula to calculate a representative sample size when simple random sampling is used. In this method

each unit of the population has the equal chance of being drawn in the sample (Ibid).

Where, N is the population size and e is the level of precision. According to Gahuti, 2013 [31] for a 95% confidence level and $p = 0.5$, size of the sample should be:

$$n = \frac{3208}{1+3208(0.05)^2} = 356$$

356 are a sample size for the study and the sample size of the institutional survey was one individual per an institution.

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

Sources and Tools of Data collection

Sources of Primary Data: Primary data was collected through household survey, focus group discussions (FGDs), key informant interviews (KIIs) and direct field observation.

A. Questionnaire/ HHs survey

Sample survey method was applied to collect primary data from sample households/farmers through structured questionnaire with closed and open ended questions according to the objectives of the study. The enumerators were selected on the base of fluency in speaking *Wolaytigna* and Amharic as well. Before the implementation of survey, enumerators were trained and tested for their clarity and understanding the questions.

With regards to the institutions, questions were directed at finding answers to weather institutions offered assistance to farmers to help them in adaptation and what form of intervention is given. The information which has been collected include; occupational information, knowledge about farmers' perception of historical environmental change, institutional intervention in adaptation activity, demographic information's and challenges in accessing institutional mediation. The questionnaire also included information about the households' socio

economic status. The data collection processes were through face-to-face contact and interviewing heads of the sample households. Initially, the questionnaire was developed in English, and then it was translated into Amharic language. The heads were oriented by the researcher and Kebele administrator about the purpose of the survey. To enhance the chance of meeting the household's heads in their villages and homes, the field and late afternoon were chosen as an appropriate time.

Research Questions

The following research questions were guided the study to reach its objectives.

- ✓ What challenges does a smallholder farmer face in accessing adaptation practices from institutions?
- ✓ What factors do hinder institutions to provide adaptation practices to smallholders?
- ✓ How can the linkage between institutions and smallholder farmers be strengthened?

B. Focus Group Discussions (FGDs)

Checklists was developed and used to systematically guide the discussions. The group included both male and female headed household heads and administrators and experts in the selected Kebele's. The number of each FGD participants was ranging from four to six and the general direction pursued in the discussion was leave for the researcher to trigger issues for discussion and promote active group participation. The aims of the discussion were to address the roles or contributions and problems of local institutions and partnerships with local people in enhancing CCA for livelihood improvements. The participants of FGDs were asked to list institutions that operate in their areas and what functions they each play, how these institutions interact with communities and how they interlink among themselves. A total of 3 FGDs were conducted in 3 Kebele administrations.

Figure 3: The researcher conducting a focus group discussion



C. Key Informant Interviews (KIIs)

Key informant interviews were used during primary data collection. This was done because to collect information from different angles especially data like intervention process, administrative issues and constraints of the institutions. The key informants were generally,

two privies Kebele administrators, two religious leaders and one smallholder farmer. A total of 15 skill full key informants, five from each Kebele administrations were selected from three administrative Kebele's. The informants were selected purposively based on the knowledge of the District.

D. Field Observation

Field observation was held by the researcher to observe the socio-economic and demographic as well as livelihood conditions of the smallholders in the area under study. Observations were a key element in identifying candidates for FGD's and interviews and also an important source of information that provide an overview of the study area. Weather characteristics, economic activities, infrastructure, traditional and cultural ways of living were noted to ensure actual field data collection success.

Data Analysis

To examine the effects of access to local institutions with their respective gains on livelihood assets of household heads, the study employed the binary logistic and multiple regression models contingent on the nature of the proxies used to represent the livelihood assets. The binary logistic regression models were used for livelihood assets characterized by dichotomous proxies while the multiple regression models were used for livelihood assets with quantifiable proxies [32].

Descriptive statistics were run to give frequencies. Multiple response questions were also be analyzed to give frequencies and percentages. Tables and graphs were also be used to present different variables. Quantitative data which is collected from household surveys; Statistical Package for Social Science (SPSS) version 20 and Microsoft Excel 10 were used for the purpose of analysis of this data. Cross tabulation and chi-square methods were used in order to find out the degree of association of each independent variable to the dependent variable. The qualitative data, generated through focused group discussions (FGDs), key informants interviews (KIIs), and direct field observation was described and presented through thorough discussion to supplement the household survey. The collected data from different sources were therefore organize into meaningful facts and made detail explanation.

Model specification: As it is mentioned above for the analysis of the data collected, binary logistic and multiple regression model was used. According to Ayele Tesema, 2008 [16], this model have been applied to test the effects of access to local institutions on the livelihood assets as well as the effects of selected livelihood assets on the welfare status of farming household heads. Before the application of the models, the multicollinearity of explanatory variables has been detected with use of variance inflation factor (VIF). Besides, the fitness of both models was checked and their P-values are less than 5 percent.

During model specification procedure Alvi, 2016 [33], the logistic regression model characterizing access to local institutions by the sample households is used as follow:

$$P_i = \frac{e^{Z_i}}{1 + e^{Z_i}}$$

Where P_i is the probability of the support being provided for the i th household and Z_i is a set of factors affecting access to institutions (X_i) and the level of participation (U_i) expressed as:

$$Z_i = \beta_0 + \sum_{i=1}^n \beta_i X_i + U_i$$

Where β_0 is the intercept, β_i are the slope parameters in the model and n is the number of explanatory variables.

The null hypothesis was tested using the chi-square test of independence. This is because; this statistical test best determines the association between the distributions of responses to the outcomes across two or more independent samples. The chi-squared test was also performed to find out whether there was any relationship between age and gender to access to institutional support. The chi-square test was conducted using the formula:

$$X^2 = \sum \frac{(o-e)^2}{e}$$

Where, X^2 = chi- square test
 = the summation
 o = observed frequencies
 e = expected frequencies

Research Variables: According to Tadesse *et.al.*, 2015 [34], a variable is a measurable characteristic that assumes different values among subjects. They are therefore logical groupings or expression of attributes [35]. DFID, 1999 [36], indicate that variables help in moving a research from a conceptual to an empirical level, employing the variables as key elements of the research problem. Literature review on adaptation

studies conducted in Ethiopia shows that, adaptation is dependent on variables such as household assets, markets and institutions ([37]. By these studies, households that have more access to any one or all of these resources were found to be able to adapt successively and vice versa (ibid). With these understandings and in line with the emphasis of this study, the variables for the study comprised livelihood assets such as, human capital, financial capital, natural capital, social capital, physical capital and local institutions that are working in the areas are among others. Brief explanations are to be presented in the table 1.

Table: 1 Livelihood assets and their selected indicators

Explanatory Variables	Description	Measurement
Human capital	Health problem/illness faced Farming training gained	Dummy: 1 for 'yes', 0 for 'no' Dummy: 1 for 'yes', 0 for 'no'
Financial capital	Access to credit Presence of saving habit	Dummy: 1 for 'yes', 0 for 'no' Dummy: 1 for 'yes', 0 for 'no'
Natural capital	Cultivated Farming land size in Hectares	Categorical: 0 for 0.01-2 hectares, 1 for > 2 hectares
Physical Capital	Total livestock unit	Categorical: 0 for 0-5, 1 for > 5
Social Capital	Number of social networks	Categorical: 0 for 1-3, 1 for > 3

Results

Characteristics of respondents

The age, sex and educational level of the respondents were presented in (Table 1). Analysis of respondent's age shows that, the mean age of respondents in the study was 40-59. About 46% of respondents represented by 159 household heads involved in the survey. About 27% (93) of the total sample fall within 18-39 and above 60+ years. Furthermore, results of data analysis showed that, more men than women were involved in the study. Men made up 65% (224) of the total sample whilst women made up 35% (121) of the study. An investigation into the location of respondents by their genders showed that, more women were involved in the Dalbo Wogene Kebele which was 43%. Women in the

Gulgula and Waraza Lasho made up about 20% and 42% respectively. Men in the Gulgula Kebele made up about 80% (92) of the total sample while men in the Dalbo Wogene and Waraza Lasho represented about 58% (67) and 57% (65) respectively. The table also indicates one of the indicators of human capital of household heads (education). In this regard majority of the respondents are informally educated. About 58% (200) of respondents were informally educated. Whereas, 4% (15) had first cycle education 17% (58) had had 2nd Cycle education which is grade 5-8 and 17% (60) had 9-10 grade levels. The remaining 3% (12) had preparatory school level. The lack of ability to read and write may deter the farming households to adopt new means of agricultural production on which their livelihood mostly depend on.

Table 1: Demographic characteristics of respondents

Attributes	Categories	Frequencies	Percent
Sex	Male	231	65
	Female	125	35
	Total	356	100
Age	18-39	93	27
	40-59	159	46
	60+	96	27
	Total	356	100
Education	Informal	200	58
	Formal	156	42
	Total	356	100

Institutions operating in the Kebele’s

Table 2 shows a classification of institutions that are operating in the study areas. Interviews conducted with representatives of institutions and smallholder farmers inferred that, there were three main types of institutions in operation in the study

Kebele. These are public, private and civic institutions. As indicated on the table, the Woreda Agriculture, health, education and cooperative offices are purely public institutions. All the NGO’s are privately owned but have non-profit goals. And like that civic institutions listed are working for the betterment of the people.

Table 2: Classifications of institutions involved in adaptation project in the study area

Agriculture Department	Send A Cow rural dev.t associations	Women self help
Education offices	Rural Community Based Dev.t initiatives	Farmers Saving and Credit
Health offices		Damota cooperative union
Cooperative offices		Iddir
Omo micro finance		Equb

Activities of the institutions in the study area

The study on the operations of the institutions working in the three Kebele showed that, apart from the Public institutions which have offices that serve people in the respective Kebele where they operate independently of staff and offices, the private institutions have their main offices in the Wolayta Zone center town of Sodo. The Cooperatives which is the civic institutions are working together with the smallholders by selecting their own chairman and other staff in the Kebele. Their main target areas and focus points of the institutions are provisions of agricultural inputs, soil and water conservation activities,

support in animal husbandry and other counseling activities by agricultural departments. Women family planning services by health departments are the main intervention area for public institutions. The activities provided by private and civic institutions are provisions of agricultural tools, inputs, provision of fattening oxen for profits, sugar and oil for cooking, strengthening the capacity of women by providing saving and credit opportunities. Iddirs and equibs also provide welfare services, insurance and play significant roles in food security and for the improvement of livelihoods of households at local level too.

In terms of hierarchy and interaction, as the IPCC, 2013 [38], posits, each of the institutions interact horizontally with other institutions involved in climate change activities in the Kebele. This was done through direct engagement they had with each other during annual meetings organized by the Woreda Finance office for NGO's and other institutions in operation within the Kebele where institutions lay out their plans as to how livelihoods in the district might be improved.

Furthermore, analysis on vertical relationships described by the IPCC (2014) amongst the institutions showed that, they were all in contact with parent institutions which were based outside the district. The public institutions for instance are controlled in terms of activities, human resources and financial resources at the Zonal levels by the Zonal public service and finance and economic development department. The Damota Union also controlled and supported by Zonal cooperative office. The NGO's although they were formed locally, receive funding for their activities from external sources which are usually foreign based NGO's. Rural Community Based development Initiative for instance has its climate change projects being financed by Action Aid France while Send A Cow has its climate change adaptation projects being funded by UK Aid, Big Lottery Fund and DFID.

Respondents Perception on the Occurrence of Climate Change

All the 356 farmers interviewed confirmed to the fact that they had observed some changes in the environment. Responses from institutional heads about the climate pattern of the area indicated that, the weather/ climatic conditions of the area had always been harsh. However, according to them, for some years now they had perceived that the weather/climate had become harsher. This was affirmed by responses received from the institutional interviews in which all the officers stated that, the area was experiencing some impacts of climate change. These changes, they stated were evident in the occurrence of flooding,

crop loss, loss of soil fertility, in coming of unexpected rains, droughts, and higher temperatures (Source: Field Survey, 2019), all of which have been described by the IPCC as impacts of climate change in tropical regions.

Results displayed in Figure 3 shows that, about 31% (112) of the respondents stated that they had observed faster changes in the climate within the past five years. About 17% of this resided in Waraza Lasho Kebele whilst 8% resided in Dalbo Wogene and 6% in Gulgula Kebele. Respondents who stated that they had observed changes in the climatic patterns over the past 10 years were made up 23% (83) of the sample. A breakdown of respondents within this group by location revealed that, 8% of this figure resided in Waraza Lasho while 9% and 6% resided in Dalbo Wogene and Gulgula respectively.

The analysis further showed that, about 17% (59) of respondents had observed climatic changes in the past 15 years. About 2% of them resided in Waraza Lasho while 11 and 4% live in Dalbo Wogene and Gulgula. The analysis further showed that, 9% (32) of respondents who stated that they had observed climate change in the last 20 years period. A breakdown of respondents within this group by location revealed that, 8% of this figure resided in Waraza Lasho while 9% and 6% resided in Dalbo Wogene and Gulgula respectively. Some others who has observed climate changes above 20 years were 19% (66) of respondents while, 4% (19), 2% (8), and 13% (44) of respondents from Waraza Lasho, Dalbo Wogene and Gulgula Respectively observed climate change in their specific locations.

The analysis shows that, majority of respondents 31% (112) have experienced climate change in the last 5 years. While 23% (83) of respondents have said that, they have observed climate change in the last 10 years. The range of experience spread within 17% (59), 9% (32), and 19% (66) of respondents who experienced climate change in 15, 20 and above 20 Years.

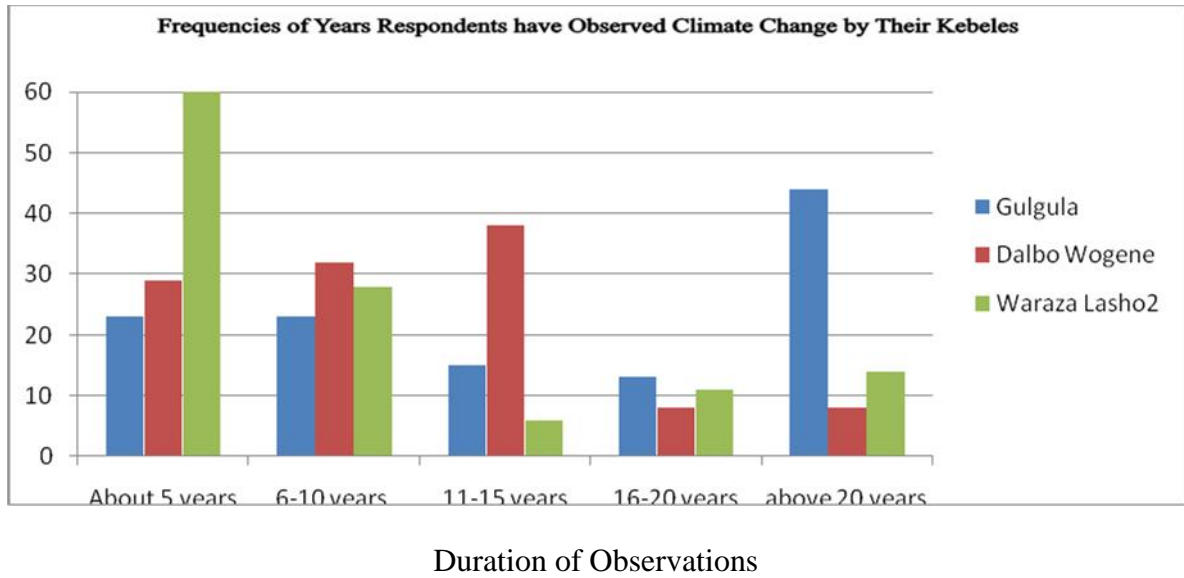


Figure 4: Number of Years Respondents has observed Climate Change

To corroborate the claims of the farmers, climate data of the Woreda from 1988 to 2018 (of 30 years data) was acquired from the Ethiopian

Meteorological Agency Southern branch. The following figure 5 shows the climate trend of the study area for 30 years.

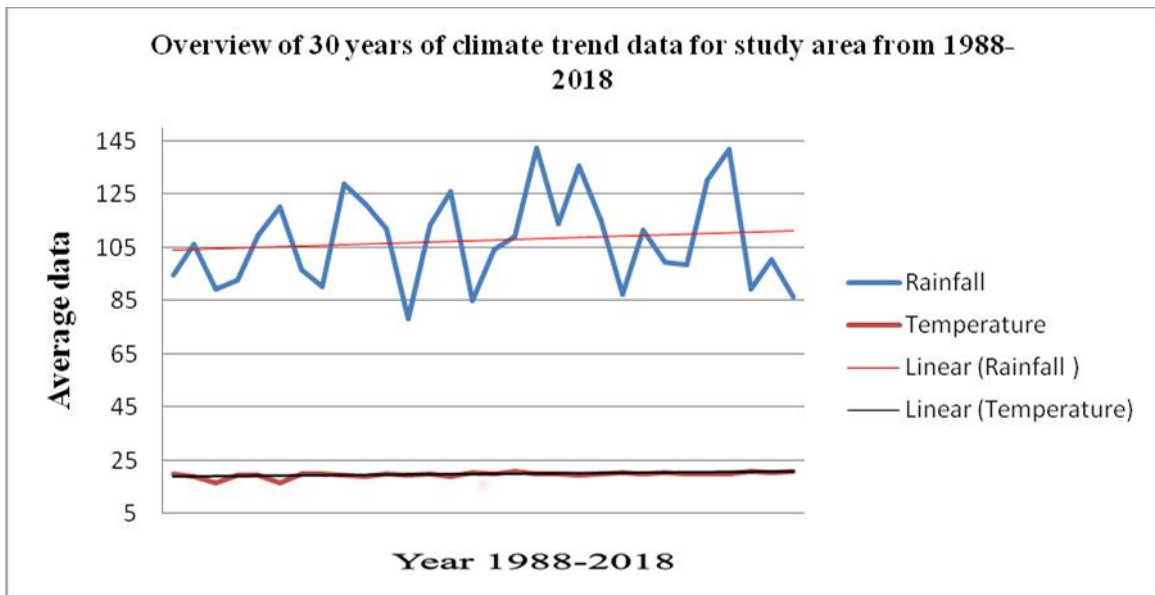


Figure 5: 30 years of climate trend data for Sodo Zuriya Woreda from 1988-2018

Source: EMA Hawasa branch, 2019 [39]

Results presented in figure 4 shows the trend of rainfall and temperature for 30 years of the study area. From the figure, it is observed that, the rainfall pattern of the area experiences cycles of

highs and lows. Although the temperature of the area is generally slightly increased when one goes up from 1988-2018. This indicates that the claim of smallholder farmer is true.

Respondents’ perceptions on the causes of climate change

When respondents were asked about the causes of changes in the climatic patterns as they were now experiencing it, 8% (23) stated that, human

activities called deforestation were to blame. Approximately 62% (228) attributed the changes to God/sin while 13% (28) blamed the cause were population growth, and the remaining 17% (77) responded that, they have no idea about the causes.

Table 3: Respondents perceptions on the causes of Climate Change

Causes of climate change	Frequency	Percent %
God/sin	228	62
Deforestation	23	8
Population growth	28	13
No idea	77	17
Total (n)	356	100

Relating to the impacts of climate change, results from the field survey indicated that, all the farming households involved in the study in the three Kebele’s felt impacts of climate change on their farming activities. When asked to state their personal experiences, all household heads and members involved in the study (n=356) attested that, the temperatures of the three Kebele’s had increased. This represents 33.3 % of responses received for this question (Table 4). About 25.7 % of the total responses received, representing 237 farmers involved in the study stated that, they had observed changes in the rainfall pattern of the Kebele. In discussing of about loss of soil fertility, 19 % attributed loss of soil fertility to climate change whilst 22% stated loss of vegetative cover as impacts of climate change they had observed.

Observed impacts of climate change on farming activities.

Results displayed in Table 6 shows the responses of household heads on how the impacts of climate

change had affected their farming activities. About 41% (331) of the total respondents stated that, due to the changing climatic patterns, they were experiencing low yields. Approximately 12% (99) of the farming households stated that they had experienced animal diseases which they attributed to changes in temperature patterns.

Results displayed in Table 6 shows that, 315 households representing 37% of the sample stated that they had lost their crops by unexpected rains (heavy rains) and longer periods of drought. Additionally, results indicate that, 9% of the farm households (72) stated that, climate change has caused animal mortality. About 1% (8) stated that, impacts of climate change affected not only their farms but also their health and infrastructure. They explained to affect their productivity as they tend to lose some working days in the bid to nurse back their health or replace infrastructure. This question had a multiple choice answers, therefore, it accounts for the whole large total.

Table 4: observed impacts of climate change on farming activities

Effect	Frequency	Percentage %
Loss of crops	315	37
Animal disease	99	12
Animal mortality	72	9
Low yield	331	41
Human diseases and infrastructure	8	1
	817	100

Farmers who have taken actions to adapt to climate change

Results displayed in Figure 6 shows that 88% (313) of farmers stated that they had over the years undertaken some measures on their farms to address the problems they were encountering in their farming activities due to climate change. Respondents who stated that they had done nothing prior to institutional support made up 12% (44) of the respondents. A look at the distribution of the respondents and their location

showed that, a majority of respondents who had taken steps on their own to adopt climate change were residents of the Gulgula Kebele. This was represented 81% (95) of respondents while 63% (75) of respondents who had taken steps to adapt resided in the Dalbo Wogene. The respondents in Waraza Lasho who had taken steps to adapt take 49% (58). Additionally, Fig. 6 shows that, 18% (21) and 7% (8) of respondents who had not taken steps towards adaptation resided in the Dalbo Wogene and Waraza Lasho Kebele respectively. While 11% (13) were from the Gulgula.

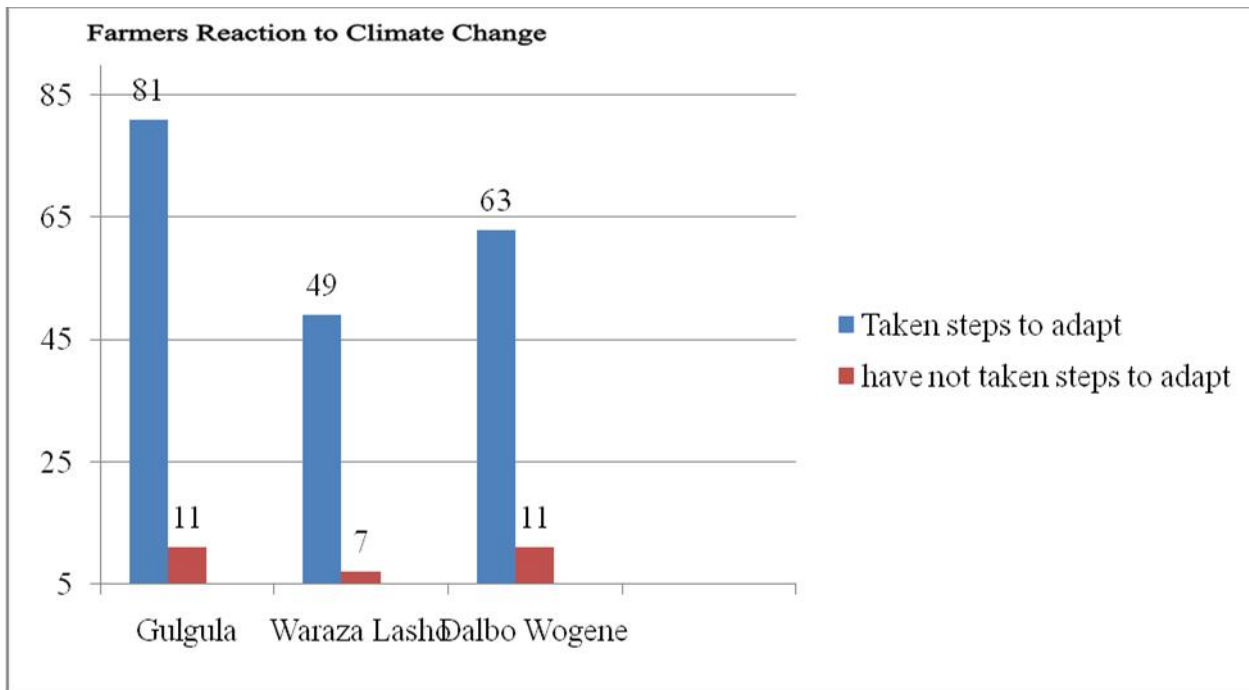


Figure 6: Farmer’s reaction to climate change

Measures undertaken by farmers and their effectiveness

Respondents who stated that they had carried out some measure on their farms to cope with climate changes were probed on what measures they had actually implemented, household heads stated the following points:., fertilizer application, crop rotation, use of improved seeds, trade, labour work, asset selling, mobility, collecting fallen leaves from backyards, prayer, making of trench, enset and banana leaf eating for themselves and feeding animals, money loaning, changing planting dates to suit the rainfall pattern and

application of compost as measures they had implemented (Table 5). The study probed further to find out the effectiveness of the measures they had put in place. Results indicated that, 81% (845) of the responses rated their measures effective while 19% (199) stated that they had not seen any improvement since they implemented those measures on their farms. As displayed on Table 5, responses per an adaptation choice were high as farmers implemented a combination of measures to help them adapt to the changes they were experiencing. This accounts for the high frequencies.

Results displayed in Table 5 shows that, 1% (13) of the respondents stated that, they applied compost to the soil. All the respondents who answered this question rated it as successful. Furthermore, results indicate that, 12% (140) of

household heads stated that, they applied fertilizers to enrich the soil. While 9% (105) rated fertilizer application effective, 3% (35) rated it ineffective.



Figure 7: Adaptation measures smallholders practically taking in the farm

Farmers on making trench chopping enset to feed cattle's growing Dashuwa (Elephant grass)

Trade and prayers are other strategies farmers stated to have implemented on their own. Results indicate that, approximately 10% (103) of the respondents stated that they practiced trading and prayer as a measure to handling the problem of

food shortage in their house. Table 5 shows that, 9% (95) of them rated trading effective while 1% (8) rated it ineffective. Additionally, the results show that, 1% (8) of respondents stated that they used crop rotation on their farms. Results show that all of the respondents who have answered the question witness they were effective.

Table 5: Measures taken by farmers and their effectiveness

Measures	Effective	None effective	Frequency %	Total %
Application of compost	13	0	1.1	1
Trade	103	8	9.5	10
Labour work	101	0	8.6	10
Mobility	82	5	7.5	8
Changing planting dates	150	38	16	14
Using resistant variety	286	35	28	27
Making trench	31	0	2.6	3
Prayer	18	0	1.5	2
Enset leaf	52	12	5.5	5
Money loaning	32	0	2.6	3
Crop rotation	8	0	1	1
Fertilizer application	140	35	15	13
Total	1,044	113	100	100

Approximately 27% (286) of the respondents stated that they used improved seeds (Table 5). From of this proportion, 88% (251) rated this measure as effective while 12% (35) rated it ineffective as displayed in the Table 5. Furthermore, results presented in Table 4 shows that, 14% (150) of respondents stated that, they constantly changed their planting dates to fall within the observed rainfall season for the years. Out of this proportion, 78% (112) rated the measure as being effective while 22% (38) rated the measure non-effective.

Additionally, results in Table 5 shows that, 8% (82) of respondents stated that, they had implemented mobility/migration as a measure to handle falling yields and to pass hard time working in other region as a result of climate change. While 94% (77) of farmers who used this option rated mobility/migration effective, 6% (5) rated it as non-effective. About, 10% (101) of the respondents stated that they used labour work as a measure to handle the challenges posed by climate change to their farming activity. As indicated on Table 5, all of the households that used labour work as livelihood strategy rated it effective.

Results displayed in Table 5 shows that, 3% (31) of farmers who respondents stated that, they built a trench to better protect farming land from

runoff. All the respondents who answered for this question rated it as successful. Furthermore, results indicate that, 2% (18) of household heads stated that, they used prayer to God. In this all the respondents replied it was effective. Additionally, results in Table 5 shows that, 5% (52) of respondents stated that, they had used enset and banana leaf and sheath as a measure to handle bad time with cattle's fodder happened by as a result of climate change. While 79% (41) of farmers who used this option rated it effective, 21% (12) rated it as non-effective. Additionally, results in Table 5 shows that, 3% (32) of respondents stated that, they had implemented money loaning as a measure to handle bad times that had happened as a result of climate variability. While 39% (12) of farmers who used this option rated it as effective, 61 % (20) rated it as non-effective.

Access to institutional support in the study area

Results from the field study indicated that, institutions in three Kebele's were offering some form of support to farmers to help them adapt to climate change. Table 8 displays that, 73% (256) of households sampled for the study received institutional support while 27% (93) of households involved in the study did not receive any form of institutional support.

Table 6: Farmers access to Institutional Support

Access to institutional support	Frequency	Percentage %
Receive support	256	73
Do not receive support	93	27
Total (n)	349	100

Source: Field survey, 2019

Rate of access to institutional support in the study Kebeles

Field results also indicated that, approximately 18% (96) of farmers in the study who received institutional support resided in the Dalbo Wogene while 16% (93) resided in the Waraza Lasho

Kebele, 12% (57) live in Gulgula. Results also showed that, 28% (43) of households sampled for the study who did not receive institutional support lived in the Gulgula Kebele while 12% (22) and 14% (28) lived in the Dalbo Wogene and Waraza Lasho respectively.

While in field, the researcher observed that, most of the respondents who subscribed to receiving institutional support belonged to individually not in groups. These were smallholder farmer. This was confirmed by all the institutions interviewed. While the Kebele Agricultural Development Agent (DA) worker and the Kebele leaders stated that, they met with each and individual smallholder farmers to maximize the efficiency level of their production, Damota Cooperative Union manager also stated that, to make individuals responsible for the support they give, individual contact is best and the only option for better coordination.

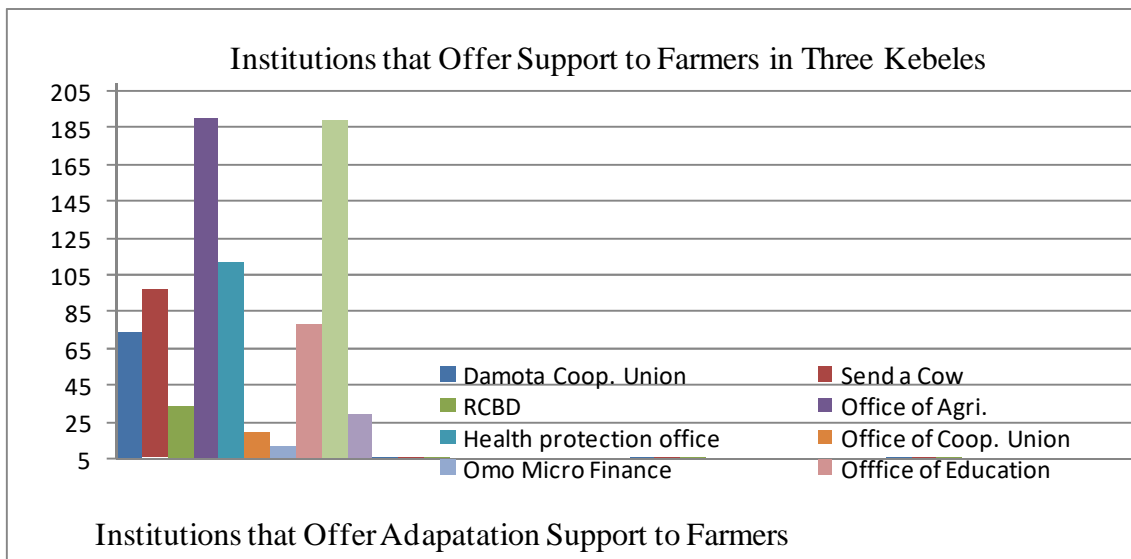
Institutions from which farmers in the study Kebele received adaptation support

When the proportion of the sample that received institutional support were asked about the institutions that offered them support, about 12% (74) of respondents stated that they received support from Damota Cooperative Unions (Figure 8). Approximately 16% (97) of respondents received support from Send a Cow Rural Development associations while RCBDA had 6% (34) of respondents being subscribed to their adaptation intervention. Results in Figure 8 show that, 31% (191) of respondents received support from the Agricultural Development office; 18% (112) received support from health Protection offices while 3% (19) received support from

Cooperative Development Office. About 2% (12) of respondents received support from Omo Micro Finance institutions, while 12% (78) of the respondents stated that they received support from Education Development Office. Again 8% (61) respondents stated that they received support from iqqub while 6% (38) respondents from Iddir. This question had multiple choice answers. This accounts for the high frequencies being recorded.

When respondents were further investigated to find out what support they received from the institutions, beneficiaries of the Dalbo Wogene Kebele residents stated that, they were provided with agricultural tools to support their farming activities; they were also provided with sheep and ox for resale after fattening as a form of livelihood diversification. Counseling support was also provided. Respondents who were beneficiaries of the Waraza Lasho Kebele similarly stated that, they were provided with Agricultural tools, counseling, sheep and fattening oxen, improved varieties, DAFF and Urea, medication for human disease, humanitarian services and money loaning programs. Gulgula Kebele residents stated that, they benefited from agricultural training and demonstration programs, road maintenance support, similarly as like others they were provided with, supply of inputs like improved varieties, DAFF and Urea, medication for human disease and money loaning programs and linkage to market.

Figure 8: Number of households which received support per institution



Influence of gender to access institutional support

Further analysis conducted on the gender distribution of male to female headed households that received support indicated that, about 30% (103) of households that received support were male headed households while 18% (64) of households that received institutional support were female headed households. Again, approximately 34% (119) of households involved in the study who did not receive institutional support were male headed while 18% (62) of female headed households involved in the study did not receive institutional support.

A result of chi-squared analysis test of relationship between access to institutional support and gender showed that, there was a weak relationship between these variables. The test statistics, $X^2 = 0.623$, $df = 1$, $p\text{-value} = 0.430$. Since $0.430 > 0.05$, the study therefore shows that, there is no relationship between gender and access to institutional support in the three Kebele's. Local Institutions in the Kebele therefore did not consider gender before offering support to the farmers. Though this analysis represents the general relationship between institutions in the three Kebele's and access to institutional support, a review into the relationship between accesses by institution might show that, some institutions specifically introduce adaptation strategies that will help address the need of a

particular. For instance in the interview with the Send a Cow director, he stated that, their support was initially directed at women in the three Kebele's as they formed the most vulnerable group within the areas.

Influence of Age on Access to Institutional Support

Results displayed in Table 7 shows that, about approximately half the sample fell within 40-59 age group. This is represented by 47% (163) of the total sample. Out of this proportion of respondents, 61% representing 101 households received support from institutions while 39% (64) did not receive support from institutions. The next age group that was represented in the sample is the 18-39 age groups. Figure in Table 9 shows that, 27% (94) of them were involved in the survey. Approximately 59% (57) of this proportion of respondents received support while 41% (39) stated that, they received no support from institutions to help them adapt to climate change.

The 60+ age range represented 26% (90) of respondent. Table 7, 53% (51) of respondents who were 60+ stated that, they received some form of support from institutions to help them adapt to climate change. Whilst 47% (42) of respondents within the 60+ age stated that they received no support from institutions

Table 7: Age of respondents and their access to institutional support

Age	Supported	Not Supported	Total (%)
18-39	57	41	28
40-59	101	64	46
60+	51	42	26
Total (n)	209	147	100

The Chi-square test gave a result of 2.52 which is also greater than 0.1, indicating that, there is no association between age and access to institutional support. It could be concluded that, the statement made by some of the farmers and

institutions that behavioral traits such as lack of trustworthiness and laziness and relationship based support as a factors that hinder smallholders access to institution during interviews holds true.

The Effects of Access to Local Institutions on livelihoods of farm households

during the last 12 months with use of binary logistic regression model as follows.

Human capitals: Table 8 presents the probability of household heads not to face any health problem

Table 8: The results of logistic regression regarding the effects of access to local institution on health problem

Explanatory variables Exp(B)	B	S.E	Wald	Df	Sig
Access to Iddir .000	-21.512	27380.02	.000	1	.989
Access to Equib .258	-.487	.376	2.428	1	.119
Cooperative offices .779	-.249	.495	.254	1	.614
Access to office of edu. 4571.410	20.133	421.671	.000	1	.000
Access to omo microfinance .321	-1.121	.322	6.281	1	.006
Access to agricultural office 1.547	.559	.471	1.718	1	.166
Access to health institution 6.644	2.158	1.165	3.307	1	.075
Constant 11960.827	18.153	2731.023	.000	1	.896

From the table we can understand that those who have access to iddir has an odd ratio = 0.000. The reference category is those who do not have access to iddir. Therefore, the odd ratios of facing a health problem during the past 12 months are 100 percent (1- 0.000). This indicated that the probability of facing the health problem for those who do not have access to iddir is 100 percent. Those who do not have access to eqquib have the odds equal to 1- 0.258 = 33 percent. This shows that the possibility of facing health problem for those who do not have access to eqquib is about 33 percent higher as compared to those who have access to it. Having access to Omo micro finance institutions is statistically significant at 1 percent significance level and has an odds ratio equal to 0.321. This implies that the likelihood of facing health problem for the household heads that do not have access to omo micro finance institutions is 51.7 percent

(1- 0.426) higher compared to those who have access. The household head who has access to health institutions is 6.644 times more likely to face health problem compared as household head who does not have access to it (Statistically significant at 10 percent).

This might be due to lack of adequate health treatment from health institutions at the local level.

In addition to health condition of household heads, the delivery of farmer training has been used as additional proxy for human capital with assumption that the farming skill of households were gained through training. In this respect, table 9 presents the result of binary logistic regression that shows the relationship between access to local institutions and human capital in terms of training gained in the last 12 months.

Table 9: The results of logistic regression regarding the effects of access to local institution on the probability of gaining smallholder farming training

Explanatory variables Exp(B)	B	S.E	Wald	Df	Sig	
Access to Iddir	18.217	2740.53	.000	1	.876	33418.010
Access to Eqquib	-.324	.338	.818	1	.237	.557
Cooperative offices	.126	.534	.055	1	.814	2.234
Access to office of edu.	20.133	421.671	.000	1	.000	3571.414
Access to microfinance	-.285	.375	.542	1	.315	.564
Access to agricultural office	2.154	.415	26.524	1	.000	11.523
Access to health institution	18.762	2086.381	.000	1	.999	.000
Constant	-1.304	2498.098	.000	1	1.000	.147

From the table, it is possible to understand that the household head who has access to local agriculture office is 11.523 times more likely to get training to acquire farming skill as compared to those who do not have access (Statistically significant at 1 percent level). Besides, the household head that has access to Cooperative office is 2.234 times more likely to gain training as compared to those who do not belong to that group. From the discussion, we can realize that

improving the access of farming household heads to the local agricultural office is the most important effort to improve their human capital through training.

Financial capital: Table 10 and 11 present the relationship between access to local institutions and the presence of credit services and saving habit with use of binary logistic regression models respectively.

Table 10: The results of logistic regression regarding the effects of access to local institution on the probability of access to credit services

Explanatory variables Exp(B)	B	S.E	Wald	Df	Sig	
Access to Iddir	14.612	8.764	.000	1	.999	
9.843						
Access to Eqquib	.119	.403	.087	1	.768	
0.121						
Women self-help	.751	.526	2.076	1	.150	
1.793						
Farmers Saving and Credit	2.218	1.082	4.204	1	.040	
9.186						
Access to Omo microfinance	1.710	.496	11.885	1	.001	
2.127						
Access to agricultural office	1.211	.439	7.605	1	.006	
2.156						
Access to Damota union	-1.194	1.177	1.030	1	.310	
.201						
Access to Send a cow	2.153	.451	.000	1	.999	
0.021						
Constant	10.637	738.64	.000	1	.999	.000

As it can be seen from table 10, the household head who has access to Omo micro finance institution at the local level is 2.127 times more likely to get credit facilities as compared to those who do not have access to this institution (Significant at 1 percent significance level). The household head that has access to agriculture development office is 2.156 times more likely to get credit facilities as compared to those who do not have access (statistically significant at 1 percent).

Besides, the household head having access to woman self-help is also 1.793 times more likely to get credit facilities as compared to those who do not have access which is statistically non-significant at 5 percent. The household head having access to equib is 0.121 times more likely to get credit service as compared to those who do not have access to it though it is not statistically significant.

In addition, the household heads that has access to the Damota cooperative union is 0.201 times more likely to get credit services as compared to those who do not have access to this office. Access to send a cow increase the credit facilities by 0.021 compared to those who do not have access to these institutions. Regarding the presence of saving habit of household head, the household head having access to equib is 4.351 times more likely to increase the saving habit compared with those who do not have access to it at local level. This is statistically significant at 1 percent significance level. Access to Omo micro finance institutions also increases by 9.931 times more the habit of saving to household head that has access to this institution than those who do not have access with a significance level at 1 percent. In addition, household head that belongs to woman self-help is 6.531 times more likely to increase saving habit than those who has no access to this group with statistical significance at 5 percent significance level.

Table 11: The Results of Logistic Regression Regarding the Effects of Access to Local Institution on the Likelihood of Increasing Saving Habit

Explanatory variables Exp(B)	B	S.E	Wald	Df	Sig
Access to Iddir 1569226.26	18.869	8.976	.000	1	.999
Access to Equib 4.351	1.685	.458	13.547	1	.000
Access to RCBD 2.203	.790	.468	2.841	1	.092
Women self-help 6.531	2.536	1.169	4.706	1	.030
Access to send a cow 1.022	.022	.917	001	1	.981
Access to Omo microfinance 9.931	2.401	.489	24.091	1	.000
Access to agricultural office .785	-.242	.526	.211	1	.646
Access to health institution 4.662	19.157	7.451	.000	1	.999
Constant .000	42.815	3230.71	.000	1	.999

In general, the outcome of binary logistic regression reveals that access to micro finance institutions, agriculture development office, Omo micro finance institution, eqquibs and iddir play significant role in improving the financial capital of farming households at local level.

Social capital: in social capital the social networks were assessed to which household heads belong and added them together for examining the effect of local institutions on them. Accordingly, table 12 shows the multiple regression result about the effect of local institutions on total number of networks/ associations to which participants belong.

Table 12: The Results of Multiple Regressions Regarding the Effects of Access to Local Institutions on the Number of Social Networks of Household Heads

Sig.	Unstandardized Coefficients		Standardized Coefficients	t
	B	Std. Error		
Explanatory variables	B	Std. Error	Beta	
Involvement in iddir 1.372	1.426	1.015	.103	1.699
Involvement in eqquib 1.211	1.673	.251	.307	4.644
Access to omo micro finance .021	-.340	.776	-.153	-2.319
Access to agricultural office .354	.081	.169	.021	.309
Access to health office .377	.345	.628	.054	.885
Access to education office .443	.145	.258	.026	.406
Access to RCBD .017	1.543	.478	.212	2.668
Access to Damota cooperative office .041	-1.01	.609	-.155	-1.977
(Constant) .556	.731	1.422		.590

Source: Field survey, 2019

Dependent Variable: Total social network established by the household head

Note: All explanatory variables in the model are dichotomous and in which 1 = Yes & 0 = No

The table clearly indicates that involvement in eqquib, access to Omo micro finance institutions, access to iddir can significantly determine the number of social networks to which household heads belong in rural areas at 5 percent significance level. For example, involvement in a single iqquib increases the number of social network by 1.211 to household heads.

Involvement in a single iddir increases the number of social network to households by 1.372. Access to education office at local level will increase the number of social networks to household heads by 0.443. Access to Damota cooperative union decreases the number of social network by 0.041, while to RCBD by 0.017.

This might be due to lack of the frequent relationship with these institutions. During focus group discussion, the participants disclosed that most people come to the offices of Omo micro finance institution at the time of loan provision and repayment. In general, involvement in eqquibs, iddir, access to agriculture office play significant role in increasing the social capital of households at local level.

Natural capital: the study considered the farming land size cultivated by household heads for analyzing their natural capital conditions with assumption that these resources are the most important sources that yield products of utilization. Thus, multiple regression models were applied to examine the effect of access to local institutions on the size of farm land cultivated by households during the last 12 months at local level (Table 13).

Table 13: The Results of Multiple Regressions Regarding the Effects of Access to Local Institution on the Size of Farm Land Cultivated in Hectare

Sig.	Unstandardized Coefficients		Standardized	t
	B	Std. Error	Coefficients	
			Beta	
Involvement in iddir .11	.660	.820	.052	.805
Involvement in eqquib .213	-.463	.206	-.161	-2.253
Access to omo micro finance .667	-.063	.223	-.020	-.283
Access to agricultural office .832	.966	.204	.330	4.738
Access to health office .157	.812	.571	.091	1.422
Access to education office .995	.007	1.023	.000	.007
Access to send a cow .015	.422	.172	.167	2.463
Access to Damota cooperative office .314	-.251	.249	-.065	-1.010
(Constant) .597	-.523	.989		-.529

Dependent Variable: Total farm land cultivated during the last agricultural season

Note: All explanatory variables in the model are dichotomous and in which 1 = Yes & 0 = No

Table 15 clearly reveals that involvement in eqquibs, access to Omo micro finance and agriculture development offices significantly affect the size of farmland cultivated by household heads. In this regard, the household head who has access to Omo micro finance can

cultivate 0.667 more area of land plot as compared to those who do not have access to these organizations. Besides, the household head having access to agriculture development office can cultivate 0.832 more area of land plot than those who do not have access to this office.

The household head involving in Equib can cultivate 0.213 less hectare of land plot compared to those who do not have access. This might be due to the involvement of most household heads on non-farm activities like petty trade after collecting money from this social organization. Though the involvement of household heads in iddirs is not statistically significant, the involvement of household head in this institution increases the size of farming land plot by 0.11 hectares compared to those who do not have access.

Physical Capital: The study considers the livestock production of household heads as proxy for examining the physical capital of livelihood

asset. In this regard, Table 14 shows the result of multiple regression model used to examine the effect of local institutions on the ownership of livestock to household heads in Tropical Livestock Unit. Access to RCBD initiatives and Send a cow significantly affects the number of livestock ownership at 5 percent and 10 percent significance level respectively. The household head’s access to send a cow development can increase the number of livestock ownership by 1.238 as compared to those who do not have access to this initiative. Besides, the household’s access to Agriculture office can increase the number of livestock ownership by 1.764 as compared to those who do not have access to this institution.

Table 14: The Multiple Regression Result on the Effects of Access to Local Institutions on the Number of Livestock Ownership

Sig.	Unstandardized Coefficients		Standardized	t	
	B	Std. Error	Coefficients		
			Beta		
	Involvement in iddir	1.445	1.896	.054	.762
.447					
	Involvement in equib	-.303	.490	-.048	-.618
.537					
	Access to RCBD	.564	.535	.083	1.055
.293					
	Access to agricultural office	1.714	.480	.271	3.575
1.764					
	Access to health office	2.446	1.320	.128	1.852
.066					
	Access to education office	.398	.399	.073	.997
.320					
	Access to send a cow	-.327	.579	-.040	-.565
1.238					
	Access to Damota cooperative office	1.314	.903	.102	1.455
.147					
	(Constant)	-.681	2.286		-.298
.766					

Dependent Variable: Total livestock in Tropical Livestock Unit (TLU)

Coping Strategies Adopted by Households

In this section, the coping strategies households employ to adapt to climate change is presented. In order to get a real picture of what the farmers do, the analysis is done in two ways. The first part looks at the coping strategies developed by households before they subscribed to institutional support. This group is made up of respondents who received institutional support. The second part looks at coping strategies that are used by households that do not have access to institutional support. Results of analysis showed that, 73% (256) of farmers had access to institutional support while 27% (100) had no access to institutional support. However, since households combine coping strategies, the responses received for each group was high.

A. Coping strategies adopted by households before receiving institutional support

Results in the Table 17 indicates that about 49% (176) of the respondents that had institutional support stated that, they used to migrate to other parts of the country to engage in economic activities due to the problems they were facing in their agricultural activities. About 64% (37) household heads that were migrating were male headed. Female headed households were 36% (28).

Again results displayed in Table 15 shows that, labour work is another coping strategy formally implemented by 19% (98) households now receiving institutional support. Respondents stated that, they used labour work was for survival during poor yields, that was caused by climate change. Results in Table 15 shows that, labour work is a strategy that was taken up by more men than women. About 62% (61) of that stated they

used labour work as a coping strategy was male headed whilst 38% (37) of households which adopted this strategy was female headed households. Hand crafting is another coping strategy formally implemented by 25% (91) households now receiving institutional support. Respondents stated that, they used hand craft was for supporting their family in provisioning of food shortage that was caused by climate change. Results displayed in Table 15 shows that, hand craft is a strategy that was taken up by more men than women. About 69% (63) of that stated they used hand craft as a coping strategy was male headed whilst 31% (28) of households which adopted this strategy was female headed households. A look at the distribution of the sample by location and gender showed that, a total of 25% (91) of respondents 41% (37) who adopted this strategy resided in the Dalbo Wogene Kebele. This is composed of 57% (21) male headed households and 43% (21) female headed households opting for hand craft. Additionally, results in Table 11 results show that, 25% (23) of respondents who adopted hand craft resided in the Waraza Lasho. While 57% were male headed households and 43% of households which adopted hand crafting were female headed households. About 34% (31) of respondents who used hand craft were resided in Gulgula Kebele. From these results, 76% (69) respondents were male and 24% (31) were female. Because of the highest response from respondents and could therefore pass as the most widely used strategy of all households irrespective of the gender of the household head. From Table 11, approximately 21% (95) of households now receiving support stated having ever adopted it as a strategy to sustain the family during times of food scarcity.

Table 15: Coping strategies engaged households with institutional support prior to receiving support

Coping strategies						
Gender	Migration	Labor work	Hand craft	Money loaning	Asset sale	Total %
Male	37	61	73	14	29	60
Female	28	37	43	8	24	40
Total (n)	67	98	116	22	53	100

Results of the data analysis indicated that, about 6% (22) of responses from households which received institutional support shows that, they had borrowed money in the past (Table 11). The data also shows that, more male headed households opted to borrow than female headed households. A breakdown of the distribution shows that, about 64% (14), Female headed households which borrowed were about 36% (8) of the proportion of the sample that now receive institutional support. Out of which 35% (8) resided in Dalbo Wogene while, 39% (9) in Waraza Lasho and the rest 26% (6) were from Gulgula Kebele (Table 11).

Data displayed in Table 11 shows that, less woman and men were involved in the activity of asset sale which is rated as 4% (13). About 3% (10) of respondents who used asset sale were male headed and 1% (3) of respondents was female headed. A detailed analysis of the coping strategies adopted by households shows a trend in adaptation choice by gender. All the coping strategies chosen by the households were mainly male dominated strategies as males have the power to control resources, make decisions and are generally more mobile than women.

B. Coping strategies of households not receiving support

To find out if these adaptation strategies were true, farmers who were not receiving any form of support from any institutions were asked to state the adaptation strategies they had developed and were using to handle the changing climate of today's. From the total of 51% (180) of respondents who were not received institutional support, Results in Table 16 indicate that 62% (112) of the respondents that did not receive institutional support was male while 38% (68) was female. A look at their locations shows that,

37% (41) of respondents who did not receive institutional support were male headed households exists in the Gulgula Kebele. Approximately 33% (37) of male headed households who did not receive institutional support were residents of the Waraza Lasho. About 30% (34) were live in Dalbo Wogene. Female headed households which did not receive support composed 38% (68) of the total number of respondents who did not receive support. Approximately 39% (26) were residents of Gulgula Kebele. While 46% (34) were resided in the Waraza Lasho. About 16% (8) were found in Dalbo Wogene.

Looking at the gender, location and adaptation strategies used, here again, one can see that, there is a gender differentiation in the adaptation strategies adopted by the households. More male headed households than female headed ones are involved in the coping strategies of asset selling, live tree selling, migration, labour work, trade, growing improved seed and hand craft. Results indicate that 19% (36) of households were engaged in the handicraft activity. Approximately 43% (15) of them are female headed households while 57% (20) of households which engaged in the handicraft activity were male headed. Migration was also more popular with female headed households than male headed households. With reference to Table 16, about 18% (33) of respondents disclosed that, they migrated to other parts of the country to work. Approximately 35% (11) of them are females while 65% (21) were male house hold heads. Looking the results displayed on table 12 shows, about 84% (10) of respondents who not used institutional support were developed Elephant Grass (Dashuwa) as a coping strategy, whilst, 16 % (4) were female households.

Displayed in Table 16, about 7% (13) of farmers who did not receive institutional support stated that they were adapting to the changing climate by growing improved seeds. This shows that, modern adaptation methods introduced before by institutions were familiar to some of the farmers who did not receive institutional support. This might be attributed to the close ties the people have with each other therefore, making it possible for farmers who receive institutional support to share technology and knowledge with those who did not receive institutional support. Within this

group, more male headed households [66% (8) had adopted this strategy than female headed households 34% (4) as is displayed on Table 12.

Labour Work as a coping strategy being used by 20% (37) of farmers who did not receive institutional support. About 63% (23) of these households were male headed. Figures displayed in Table 18 shows that, 37% (11) of female headed households adopted labor work as a coping strategy.

Table 16: Coping strategies adopted by respondents without access to institutional support by their gender and location

Gender	Coping Strategies								Total
	H.C	M	G.I.S	L.W	A.S	L.T.S	T	E.G	
Male	21	22	9	24	17	19	24	10	68
Female	16	12	5	12	6	6	8	4	32
Total	37	34	14	36	23	25	32	14	100

Key: H.C (hand craft), M (migration), G.I.S (growing improved seed), L.W (labour work), A.S (asset selling), L.T.S (live tree selling), T (trade), E.G

Again results displayed in Table 16 shows that, asset selling is another coping strategy implemented by 12 % (23) households not receiving institutional support. Respondents stated that, they used asset selling was for survival during unproductive year, that was caused by climate change. Results in Table 18 shows that, about 74% (17) of that stated, they used asset selling as a coping strategy was male headed whilst 26% (6) of households which adopted this strategy was female headed households. Tree selling is another coping strategy formally implemented by 14% (26) households not receiving institutional support. Respondents stated that, they used live tree selling for supporting their family in provisioning of food shortage that was caused by climate change. Results displayed in Table 12 shows that, live tree selling is a strategy that was taken up by more men than women. About 73% (19) of that stated they used live tree selling as a coping strategy was male headed whilst, 27% (6) of households which

adopted this strategy was female headed households. Trade as a coping strategy being used by 10% (19) of farmers who did not receive institutional support. About 58% (24) of these households were male headed. Figures displayed in Table 12 shows that, 42% (8) of female headed households adopted trade as a coping strategy. Looking at the results presented in Table 12, there is once again a gender differentiation in the coping strategies adopted by households. All coping Strategies developed by the smallholders are male household dominant. This might be due to the fact that, the culture of the people that, it allows male to lead family. Comparing the results of this table (Table 12) to those displayed on Table 11, one can infer that, although smallholders have traditionally developed some strategies with which they cope with climate change, adoption of these strategies is dependent on issues such as wealth, social networking, gender to mention a few.

Additionally, although some farmers stated that they were not receiving institutional support, it can be deduced that, they had implemented some strategies that are from institutional sources. This they may have acquired through their social networking relations with other farmers. These strategies included use of improved varieties of seeds and elephant grass.

i. Challenges smallholders face in accessing institutional support

Results from the study indicated that, about 71% (246) of the sample household head stated that there were some challenges to accessing institutional support. As shown in the Fig. 9, about 29% (101) of the sample stated that, they experienced no challenges in accessing institutional support.

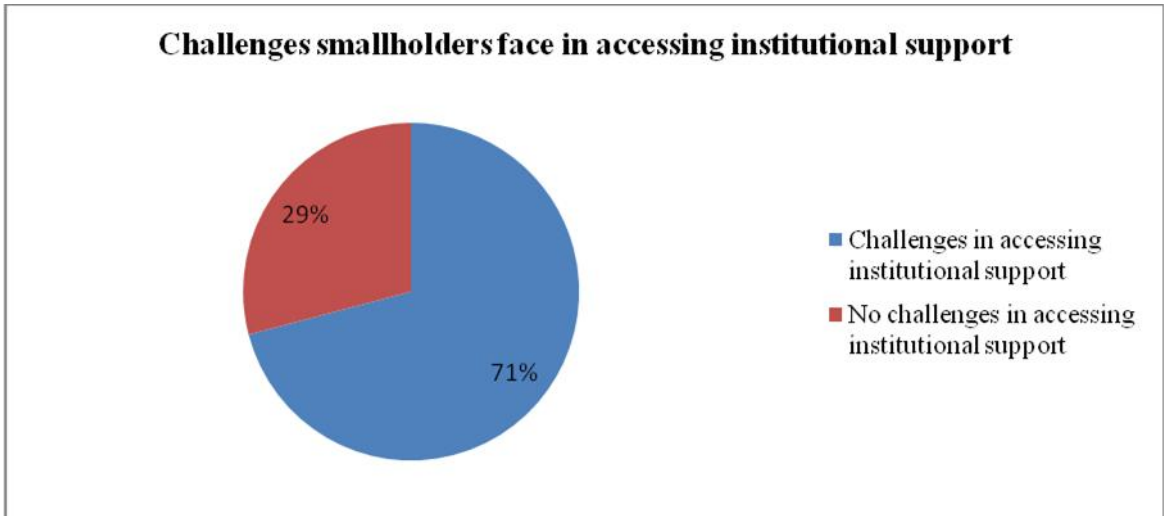


Figure 9: Proportion of respondents who faced challenges in accessing institutional support

The study further asked farmers who stated that they faced challenges in accessing institutional support to list challenges they faced in accessing institutional support. A total of 246 responses were received for this question. A majority of this proportion of farmers cited there was a barrier in

accessing institutional support. They were asked to list those barriers; majority of respondents stated that, poverty, lack of information, low education, relationships, age, trust, and clan was the most cited (Table 17).

Table 17: issues that affected smallholder in accessing institutional support

Challenges	Responses	Percentage
Poverty	37	14
Lack of information	58	23
Low education	31	12
Relationships	61	24
Age	15	6
Trust	21	8
Clan	34	13
Total	246	100

Respondents explained lack of information to mean the little or no information about the existence of institutions involved in adaptation and the services they provide to farmers on adaptation as a major challenge to accessing institutional support. This group of responses represented by about 23% (58) of the total responses received as displayed in Table 17.

Additionally, Table 17 shows that 24% (61) of respondents stated relationship based support between the representatives and of themselves as a barrier to accessing institutional support. Additionally, 12% (31) of responses received on this question cited the educational level of the household head as a barrier to accessing institutional support. Poverty, behavioral traits such as low levels of trust and age of household heads were cited as factors that could affect household's access to institutional support. These challenges respectively represented as 14% (37), 8% (21) and 6% (15) of the total responses received as shown in Table 17.

ii. Challenges Institutions Face in Providing Support to Farmers

Results obtained from the field indicated that, institutions in the Kebele also faced some form of challenges in the process of offering adaptation support to smallholder farmers. Results of the analysis indicated that, the factors that resulted in challenges to institutions faced in providing support arose from two sources. These are the institutions themselves and the smallholder farmers. The following two sections present results of data analyzed on the two sources of institutional challenges to providing adaptation support.

Internal barriers to institutional support: All institutions involved in the study except Damota Cooperative Union identified with these constraints. From the analysis, it was assumed that, this constraint arises out of the interaction between institutions and their co-institutions on the higher level as is depicted in the interview extract. While the NGO's stress financial and personnel factors as a minor constraint, the public

institutions identify both financial and human resources to be major constraints as funding and employment usually falls within the restrictions of the regional and federal level institutions.

Quotes of the interviews are presented below. *"We have limited resources especially funding and human personnel. However funding is the major constraint as funds are needed to pay our personnel and also run the projects. With more funding we can hire more people to work on our projects. Thus, reaching a wider range of people"*. (Source: Send a Cow Manager, 2019).

"Our major problems are limited staff, funds and transport." (Source: Omo micro finance institutions, 2019)

"We lack internally generated funds. The support from regional or federal Government is also not forthcoming. We also lack extension officers which makes it difficult for us to reach many distant farmers in the Kebele's". (Source: Office of agri., 2019)

"The major constraint we face in our effort of giving support to farmers lies with the late arrival of our inputs (like fertilizers and new varieties)" (Damota Cooperative unions, 2019).

Demand-side barriers that hinder institutional support: On the demand side barriers, all the institutions in the three Kebele have stated character traits as the major barriers. These included lack of showing to financial commitment to pay for adaptation support and lack of showing commitment to adaptation supports. This results from the fact that, an institution has recognized the need for a particular adaptation strategy. However, the people for whom this strategy is meant do not see the need for it therefore do not accept it to ensure its success as is described by the interview with coordinator of agricultural office. This relates directly to the findings of Gutu, 2017 [40]. The Kebele administrator pointed out that, there is lack of trust between public institutions and smallholders, many of the farmers were put in prison with their cattle's, this was because of lack of repayment for the support

provided by the institutions. This again created mistrust between the NGO’s and farmers.

Question: *Do the farmers do anything that hinders your institution’s efforts in providing them with adaptation support?*

Answer: *“Yes they do. The only thing is that, farmers want everything for free. When it is time for them to contribute something to ensure they adapt successfully, they draw back. For example, some time ago, a letter was received informing farmers in the Kebele about the possibility of acquiring early maturing mango seedlings from RCBD at a cost of 5 birr; however, transportation will be free if they could order for 100 seedlings. When farmers were informed to contribute to cover the cost, they could not obligate themselves to it.”* (Source: RCBD, 2019).

“Some of the farmers have no good feeling to the support provided by the institutions. Because if they received the support from institutions and lacks repayments/ back payments to pay for the support they received, they were asked forcibly to pay by the public institutions. Therefore, most farmers do not want any form of support from the institutions”. (Source: Kebele leader, 2019).

“What prevent some of the people from coming forward are their past experiences with other NGO’s. Some of the farmers feel discriminated against by development workers and which arises out of political differences (levels of participation) therefore they do not trust the NGO’s until they begin to see the effect of their activities.” (Source: D.A, 2019).

iii. **Improving the Linkage between Smallholder Farmers and Institutions**

Respondents were asked to recommend ways access to institutions could be improved considering the challenges they faced before accessing institutions. Results indicated that, 44% (156) of farmers involved in the study did not respond to this question whilst 56% (200) responded. Results displayed in Table 20 shows the views of respondents on how farmer’s access to institutions can be improved. From the table, 24% (49) respondents suggested that, institutions involved in agricultural development should open offices in Kebele level to ensure that, farmers who need their services would not travel very far to reach them.

Table 18: Respondents views on how institutional access can be improved

Views	Frequency	Percentage
Increasing the number of DAs	56	28
Open office at the Kebele level	49	24
Work with truthfully	61	31
Improvement of road network	14	7
Creating awareness lesson	20	10
Total	200	100

Furthermore, 10% (20) of responses received stated that, institutions must educate farmers on their existence and services so that, farmers can access them when they needed to. Results displayed in Table 20 shows that, 7%(14) respondents reasoned that, road networks in the three Kebele must be improved to ensure that, officials of institutions who offer adaptation support can reach farmers in all parts of the Kebele. 28% (56) respondents suggested that,

institutions should employ more DAs who understand and speak the Wolaytigna language to enhance communication flow between themselves and the officials of institutions. One respondent stated that, the numbers of Agriculture extension agents be increased to ensure they cover a wider area than they do now. As farmers have over the years developed trust for extension officers and can thus freely inform them of their problems.

Discussion

Institutions Operating in the Districts

Findings from the study indicated that, the three main types of institutions described by (Agrawal, 2010 and Gortner *et al.*, 2007) [7, 14], were in existence. These are state/ bureaucratic (public), private and civic institutions. As displayed in Table 2, the public institutions that were in operation in three Kebeles are the office of agriculture, cooperative office, health protection office, education offices and Omo micro finance institutions. These institutions were established by legal provisions and have their resources and activities controlled by the state [7]. Based on the analysis of interviews with the Kebele Administrators of the study areas inferences could be made that, the Kebele administrators did not work directly with farmers by providing inputs however, according the legal bases of the country they are a facilitator for Woreda Agricultural Development Offices and with other local institutions.

Two Non-Governmental Organizations (NGO's) were identified in the three Kebele. They are all privately run NGO's whose purposes are determined by officials within the organization and are funded by donor agencies to which they hold their accountability [7, 41].

Civic institution called Damota Cooperative union targets and encourages farmers to form groups which are based on characteristics such as trust, hard work and financial base. These groups serve as the channel through which farmers are offered support in the form of subsidized farming inputs at their door steps and Iddir and eqqub were other traditional local welfare service institutions that are found in the areas [14].

Respondents Perception on Climate Change

Results of analysis of respondent's perception on climate change indicated that, all the respondent stated that they had observed changes in both rainfall and temperature. Statistical analysis

conducted on rainfall showed that, although some variability was recorded in the mean rainfall of the period, and the record showed that it cycles of high and lows and statistically significant (Fig. 3 and Fig.4) thus, contrasting the claims of respondents analysis of temperature however, checked with respondent's observation that the temperatures had increased (Fig. 4) as statistical tests indicated a significant change in temperature (Fig. 4).

Despite the high level of significance in rainfall experienced in the area, the study cannot successfully conclude that respondents perceived the weather wrongly perhaps had the study conducted an analysis into the monthly rainfall trends results might reveal changes in the duration and amount of monthly rainfall of the area in each year. Also, the analysis showed that the amount of rainfall recorded annually in area had increase and decrease thereby confirming the findings of (Bamlaku *et.al*, 2015) [42], that, there is a general variability in the total annual rainfall recorded in the country.

Again, results of the analysis on the climatic data displayed in Tables 3 and 4 shows that, the knowledge about climate change and its causes within the farming population of the Kebele is high. This is because; all the sampled population knew what climate change was and could describe what it was even though the question did not implicitly state climate change but rather environmental change. From their responses it can be inferred that, they had climate education and that has been accepted by the people. This can confirm that, the radio promotion in Wolaytigna language and face to face interactions involving institutional staff and farmers have been successful. Again, the study can deduce that, at the informal level, farmers within the Kebele cooperate and share information with each other thus household heads that do not own radio sets or belong to a farmer group who receive information on climate change and adaptation from friends and relatives who have radio sets or belong to a farmer group.

Additionally, both farmers and institutions noted that, the Sodo Zuriya Woreda was experiencing some changes in the climate of the Zone. They explained the changes they were experiencing to include unexpected rainfall extending for longer time than they had previously observed and also more intense and leading to flooding. This finding also relays with the findings of IPCC (2013) [38] and CIGI (2009) [6], who found out through their various assessments that in the tropical areas, the major impacts of climate change will be felt in the climatic variables of rain and temperature. The conceptual framework by (Agrawal, 2008) [9], also supported these statements. As the conceptual framework suggests, stressors on the rural environment have trends and may be seasonal. As can be inferred from the farmers response, there are seasonal trends in the occurrence of the climate change impacts they experienced. While droughts are associated with the dry season, floods usually occurred during the rainy season.

Observed Impacts of Climate Change on Farming Activities.

The responses received from the field directly relays with Ellina's (2006) [43], findings on the impacts of climate in agriculture within the tropical region and the conceptual framework where the impacts of climate change have been identified to have both agricultural and non-agricultural impacts on societies. As displayed in Table 6 impacts of climate change stated by farmers range between those that directly affect their farming activities and those that affected the health and welfare needs of smallholder farmers. The FAO, (2008) [44], found out as the farmers in this study have stated, that, climate change has the ability to affect the basic elements of food production such as soil, water and biodiversity. Therefore, there might be some truth in the farmers attributing loss of soil fertility in the study areas to climate change although more studies must be conducted to ascertain whether the climatic factors are solely the cause of loss of soil fertility in the study Kebeles.

Actions Farmers Have Taken to Adapt to Climate Change

As stated in the result section, all respondents of the study stated that they had observed some changes in the climate which was affecting their productivity, the study required to find out what actions they had undertaken on their own (outside of institutional support) to address the problems they stated to be experiencing on their farms. However, findings showed that, not all farmers had taken any response strategies on their own (Table 8). This supported by the findings of Chamberlin, (2007), [45] that, though farmers may be highly aware of climate change, not all of them adjust their farming practices to reduce the impact of climate change on their productivity. The reason why some farmers may not be able to adjust their activities could for instance be due to the alternating periods of droughts and floods for instance.

Additionally, from results presented in Tables 17 and 18, extrapolations can be made that, coping strategies used by most smallholder farmers in three Kebeles before the receiving institutional support were, livelihood diversification into on-farm and off- farm activities such as migrating and live tree selling as cited by Gortner *et al.*, (2007) [7], Agrawal (2010) [14], and Agrawal and Perrin (2008) [13]. During discussions period, respondents were asked why they chose these strategies, they elucidated that, these particular strategies were used by their descents and they also believe they would help them cope with the changing trends as they called it. Again, a careful study of the strategies adopted by households which are now receiving support from institutions shows that, institutions usually developed adaptation strategies based upon the coping strategies and needs of the people in the community as described by Agrawal and Perrin (2008) [13].

Effect of Institutional Support on Smallholder Adaptation

Results of Chi-Squared analysis presented in section 4.1.11. suggested that, there is a significant difference in the influence of institutions in climate change adaptation. This finding varies from that of Mphande, (2016) [46], whose study described institutional support as ineffective. From field discussions, farmers indicated they had witnessed improvements in their farm productivity. Furthermore, respondents who received non-agricultural support also attested to the fact they had noted an improvement in their incomes due to their participation on labour work, construction jobs, and other livelihood diversification options. However, as 71% farmers involved in this study were not knowledgeable, they could not keep records of their farm earnings and those from other sources so as to provide evidence to their claims.

Challenges Farmers Faced in Accessing Institutional Support

Findings of the study indicated that, respondents encountered barriers in their attempt to receive institutional support (Fig. 8). The barriers stated by the respondents in Table 18 fit directly into the conceptual framework and the findings of Nnandi (2015) [47] and (Philip *et al.*, 2016) [17], on barriers the institutional and cultural barriers to climate change. Philip *et.al* (2016) [17], identified institutional, environmental and socio-cultural barriers affecting adaptation to climate change. Education and poverty could be defined as socio-cultural barriers [47].

Respondents stated trust as a barrier affecting their access to institutions (Table 18). It can be realized from field observation that, trust falls under behavioral barriers as it results from behavioral traits of the individual farmer. While informational barriers can be classified as both institutional and socio-cultural, in the case of this study, the farmers ascribed informational barriers as an institutional barrier. The respondents explained their reason for ascribing informational

barriers to institutions was as a result of their ignorance about the existence of some of the institutions. This then makes it difficult for them to approach the institutions or offer a hand in their activities as cited by Agrawal, (2010) [14]. Furthermore, discussions with respondents confirmed the findings of Temesgen *et al.* (2014) [12], that lack of information on the right adaptation strategies and weather conditions as barriers that affected their adaptation.

Problems institutions face in providing support to farmers

As identified elsewhere by Gortner *et al.* (2007) [7], Philip *et.al*, (2016) [17] and the conceptual framework, institutions in the study Kebele also faced some form of challenges in the process of offering adaptation support to smallholder farmers. Appraisals of interviews held with institutions presented in Section 4.1.16 shows that, institutions identified two groups of barriers that affected their ability to provide adaptation support to smallholder farmers.

As discovered by earlier studies Uphoff and Buck (2006) [48], IPCC (2013) [38], Terefe, (2014) [32], institutions involved in the study faced challenges in providing adaptation support which they described arise from the structure of their organizations from within the institutions themselves which affects their efforts at addressing climate change. These are factors that arise from within the institutions and those that arise as a result of actions of the smallholder farmer such as lack of finance and trained human resources .

Improving the linkages between Institutions and Smallholder Farmers

Respondents of the study were given the opportunity to suggest ways the gap between farmers and institutions can be bridged so as to increase their rate of access to support. From the results of analysis presented in Table 18, respondents called for institutions to expand their offices to other locations wide, they forwarded institutions to work truly to the farmers and to

create awareness lesson among the one they stated. These responses from the field relate to the findings of Terefe Abebe, (2014) [32], especially since trust between smallholders and institutions were the best mechanism to create good working environment with the farmers. In contrast to the findings of others studies, respondents of this study called for provision of extensive information on the existence of institutions and types of adaptation support they provide and processes farmers must go through to access the support. Also this study identified that, one peculiar issue that hinders their access to institutional support is communications and therefore called for employment of indigenes by institutions.

Conclusion and Recommendations

The study was pursued to find out the role of institutions in adaptation to climate change among smallholder farmers in Sodo Zuriya Woreda. The impacts of climate change on economic sectors are real and smallholder farming is one of the most vulnerable sectors to climatic change. Consequently, adaptation of smallholder farmers to climate change is needed to ensure the sustainability of their livelihoods and to safeguard food security. Institutions have been identified to play important roles in adaptation as they shape the response and strategies households adopt to reduce the impacts of climate change.

In order to measure the role and of institutions in adaptation to climate change, the study took a sample of 348 smallholder farmers and 8 heads of institutions involved in smallholder agricultural development activity in the three studies Kebele. Information was pursued about role of institutions, the challenges institutions and farmers face in giving or receiving support among others. A result collected from the field was analyzed with SPSS and Microsoft Excel.

The study findings indicated that, the knowledge and perception of climate change in the study area was high as both smallholder farmers and institutions were aware of its impacts which they

described to have both agricultural and non-agricultural effects. Further the study showed that, institutional support provided to farmers to address the impacts of climate change is successful nonetheless the study could not validate the responses of farmers as most of them were unlearned and therefore kept no records. Also in line with objective two of the study, outcomes indicate that farmers faced challenges in accessing institutional support which arose from lack of information, low number of extension worker (DAs), lack of offices at Kebele level and poverty to mention a few. Again, the study found that, institutional challenges to offering climate change adaptation support may arise from either the structural and organizational decisions which may result in low human resources and finance, from character traits of the people whom the institution wishes to support (such as low financial commitment to pay for support, apathy to adaptation projects) or from social norms operating in the district.

The study also found that the engagement of private and civic sectors to fill the gaps left by public sectors to meet service needs of farming household heads is at infant level. This is owing to poor infrastructure facilities and market links in the study areas. In addition, the statistical results show that, those household heads that have access to health institutions and agriculture development offices, Omo micro finances are more likely to improve their human and financial capital of livelihood asset. The access of household heads to Equibs, RCBDs, Send a Cow, agriculture development office and health institutions are also significantly determine the natural and physical capitals of livelihood assets at local level. Furthermore, the household heads with improved livelihood assets like financial capital, natural capital and physical capital are more likely to have better-off welfare status as compared to those who are with low conditions of these capitals. In general, accessibility of farming households to formal and informal local institutions have significant contribution for improvements of livelihood assets such as human, financial, natural, social and physical capitals at local level.

Based on the results discussed above, the study came out with a number of recommendations. These include:

- Considering the population status in the study areas together with the poor nature of roads, the study recommend that institutions involved in adaptation at the Kebele level should develop innovative ways of meeting with smallholder farmers in remote parts of the Kebele. This could be done through outreach services on specific days that would be convenient to the people such as market days when people from the remote parts of the districts come to trade. Again, institutions involved in the adaptation process must employ more local people so as to enhance effective communication between the institutions and the smallholder farmers.
- The Government, private sector and other stakeholders should come together to draw a plan on how to change the production and productivity of smallholder and to aid to adapt climate change.
- The study further recommends that, institutions and political and or government leaders must work together to educate the people on the importance of paying for certain services to ensure that their productivity increases in this period of climatic changes. During the data collection, it was observed that, most of the farmers considered institutional support to include only support which comes freely. However, some of the institutions provide these services at a cost which the farmers do not consider as support.
- There is the need for a policy by government and institutions to ensure sustainability of interventions towards smallholder adaptation. Institutions which provide adaptation support to smallholder farmers must ensure the sustainability of interventions they introduce to farmers as opposed to what happens in most cases where when a particular project run by an institution is ended, the institutional investigation for the intervention also comes to an end. This creates difficulties for smallholder farmers to continue with the particular interventions. This is especially true in the case of NGO's and public organizations. If they could charge beneficiaries of such interventions a sign to ensure project sustainability, it would go a long way to increase the productivity of farmers.

➤ The improvement of financial, natural and physical capitals of livelihood assets play remarkable role for promoting the welfare status of farming households at local level. Therefore, the local government bodies should work hard to improve the accessibility of all formal public institutions to meet the service needs of people that can change their livelihood. It is clear that all activities could not be satisfactorily undertaken only by the effort of local public institutions. In this regard, it is very important for all stakeholders to improve the infrastructure facilities mainly road to attract the potential private sectors and civil society organizations like NGO's to the local areas for adding their contribution.

➤ Lastly, the role of informal traditional institutions on building the livelihood assets of farming household heads at local level is notable. Therefore, they should be empowered to enable and rebuild their technical, financial capacity and promote the acceptance of legality to assume greater responsibilities in provision of sustainable social services that build the livelihood assets of local people. According to Chambers and Conway (1992), the livelihood of people can be sustainable if they are able to adopt diversified livelihood strategies to cope with shocks and strengthen their capabilities and assets both at present and in the long run. Thus, the local institutions should collaborate to each other to periodically train and advice farming household heads to involve in different livelihood strategies like off-farm and non-farm activities in addition to their current on- farming activities.

References

1. Intergovernmental Panel on Climate Change (IPCC), 2017. The special IPCC report on 1.5 °C in the perspective of the IPCC Sixth Assessment Report (AR6) Ecole des Ponts ParisTech.
2. Amazon Institute for Environmental Research (AIER), 2005. Tropical Deforestation and Climate Change. Amazon Institute for Environmental Research, environment defense, Washington DC - USA

3. Baccini, A. 2012. Estimated carbon dioxide emissions from tropical deforestation improved by carbon-density maps, nature climate change (Vol-2) DOI: 10.1038/nclimate1354
4. Dessalegn, O. Gemedal., and Akalu D. Sima., 2015. The impacts of climate change on African continent and the way forward. *Journal of Ecology and the Natural Environment*, Vol. 7(10), pp. 256-262, DOI: 10.5897/JENE2015. 0533
5. United Nations Framework Conventions on Climate Change (UNFCCC), 2007. *Climate Change: Impacts, vulnerabilities and adaptation in developing countries.*
6. Centre for International Governance Innovation (CIGI), 2009. *Climate Change in Africa: Adaptation, Mitigation and Governance Challenges*, The Centre for International Governance Innovation (CIGI), Waterloo, Ontario, Canada (www.cigionline.org). Commons, IASC, Japan, pp. 40-40.
7. Gortner, H., Nichols, K. and Ball, C. 2007. *Organization Theory: A public and Non-Profit Perspective*. Belmont, California, USA: Wadsworth Thomson Learning.
8. Boka, Gutu T. 2017. *Climate Change Challenges, Smallholders' Commercialization, and Progress out of Poverty in Ethiopia*, Working Paper Series N° 253, African Development Bank, Abidjan, Côte d'Ivoire.
9. Agrawal, A. 2008. The role of local institutions in adaptation to climate change. In: paper prepared for the social dimensions of climate change. Washington D.C. social development department, The World Bank (March 5-8)
10. Wang, J. 2016. *Climate adaptation, institutional change, and sustainable livelihoods of herder on climate change*. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp.1-9.
11. IPCC (Intergovernmental Panel on Climate Change), 2013. Summary for policymakers. In: *Managing the Risks of Extreme events and Disasters to advance Climate Change Adaptation*. A special report of working groups I and II of the Intergovernmental panel on climate change. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp.1-9.
12. Temesgen Bezabih, *TewodrosT., Henok Sh.,Amdom G.*, 2014. Role of Rural Institutions in Determining Farmers Adaptation to Climate Change: The case of Kilte-Awlaelo District, Northern Ethiopia, *International Journal of Multidisciplinary and Current Research*, ISSN: 2321-3124
13. Agrawal, A. and Perrin, N. 2008. *Climate Adaptation, Local Institutions and Rural Livelihoods*. Michigan: International Forestry Resource and Institutions Programme
14. Agrawal, A. 2010. The Role of Local Institutions in Climate Change Adaptation. In T. W. Bank, and R. M. Norton (Eds.), *Social Dimensions of Climate Change* Washington DC, USA: World Bank. (pp. 173-197).
15. Sarah Ellis. 2008. *The Changing Climate for Food and Agriculture: A Literature Review* Institute for Agriculture and Trade Policy Minneapolis, Minnesota
16. Ayele Tessema. 2008. *Livelihood Adaptation, Risks andnVulnerability in Rural Wolaita, Ethiopia*, PhD Thesis Environment and Development Studies,Dissertation Department of International Environment and Development Studies, Noragric Norwegian University of Life Sciences, UMB No. 2008: 46,
17. Philip E, 2016. The Effects of Climate Change on Livelihoods of Smallholder Farmers in the Upper East Region of Ghana *International Journal of Sciences: Basic and Applied Research (IJSBAR)*(2016) Volume 28, No 2, pp 1-20
18. Adger, W.N. 2003. Social capital, collective action and adaptation to climate change, *Economic Geography*. 79 (4): 387-404.
19. Wolaita Zone Bureau of finance and economic development (WZFEEDD), 2018. *Population and development, yearly booklet, Wolayta Zone Finance and Economic Development, Wolayta Sodo.*
20. Girma Jatana and Zegeye Paulos. 2017. *Farmer's Participation in Participatory Forest Management and Factors Affecting its Performance (The Case of Sodo Zuriya*

- District, Wolaita Zone , Ethiopia) Journal of Economics and Sustainable Development Vol.8, No.9.
21. Befikadu *et.al.*, 2018. Trends in Extreme Climate Events over Three Agroecological Zones of Southern Ethiopia Advances in Meteorology Volume 2018, Article ID 7354157, 17 pages <https://doi.org/10.1155/2018/7354157>
 22. Jatana and Zegeye Paulos. 2017. Farmer's Participation in Participatory Forest Management and Factors Affecting its Performance (The Case of Sodo Zuriya District, Wolaita Zone , Ethiopia) Journal of Economics and Sustainable Development Vol.8, No.9.
 23. Almaz Balta, Ayele Tessema, Debebe H/Wold, 2015. Assessment of Household Food Security and Coping Strategies in Wolaita Zone: The Case of Sodo Zuria Woreda, Hawassa University and National University of Ireland; College of Cork (UCC) Journal of Poverty, Investment and Development www.iiste.org ISSN 2422-846X An International Peer-reviewed Journal Vol.18,
 24. Geoffrey M, 2006. What Are Institutions? Journal of economic issues , Hatfield, U.K.
 25. Nicholas Walliman. 2011. Research methods the basics, routlage publications, Oxford Brookes University, UK
 26. Naing, *et.al.*, 2006. Sample Size Calculator for Prevalence Studies. Archives of Orofacial Sciences; 1: 9-14
 27. Guillaume Chauvet, Crest Ensaï. 2015, Coupling Methods for multistage sampling, Institute of Mathematical Statistics in *the Annals of Statistics*, 2015, Vol. 43, No. 6, 2484–2506.
 28. Calogero Carletto 1999. Constructing samples for characterizing household Food security and for monitoring and evaluating food security interventions: Theoretical concerns and practical guidelines, International Food Policy Research Institute, Washington, D.C. 20006 U.S.A.
 29. Meenu M, P. and Prabhat P, 2015. Research methodology; Tools and Techniques, Al. Marghiloman 245 bis, 120082, Romania
 30. Yamanes, T., 1967. Elementary sampling theory. Prentice Hall.
 31. Guwahat, 2013. Determination of appropriate sample size, International Journal of Applied Mathematics and Statistical Sciences Vol. 2, Issue 1,
 32. Terefe Abebe. 2014. The Potentials of Local Institutions for Sustainable Rural Livelihoods: The Case of Farming Households in Dawuro Zone, Ethiopia, American Research Institute for Policy Development, Vol. 2, No. 2, pp. 95-129
 33. Alvi, H., 2016. A Manual for Selecting Sampling Techniques in Research, Munich Personal RePEc Archive, University of Karachi, Iqra University
 34. Tadesse, B *et.al.*, 2015. The Roles of Customary Institutions in Adaptation and Coping to Climate Change and Variability among the Issa, Ittu and Afar Pastoralists of eastern Ethiopia, Change Adaptation Socioecol. Syst. 2015; 2: 141–157
 35. Chambers, R. and Conway, G. 1992. Sustainable rural livelihoods: Practical concepts for the 21st century. IDS Discussion IDS, Brighton. Paper 296.
 36. Department for International Development (DFID), 1999. Sustainable livelihoods guidance sheets. London: Department for International Development (DFID), UK.
 37. Amsalu Yalew. 2016. economy-wide effects of climate change on Ethiopia, Dresden
 38. IPCC (Intergovernmental Panel on Climate Change), 2007. Climate Change 2007: the physical science basis (summary for policy makers), IPCC.
 39. Habtamu D.B., Samuel Sh. B., 2018. The Role of Indigenous Knowledge in Climate Change Adaptation: The Case of Gibe Woreda, Hadiya Zone, Ethiopia, International Journal of Environmental Protection and Policy, 104-113.
 40. Gutu Tesso, Bezabih Emanu, and Mengistu Ketema. 2012. Econometric analysis of local level perception, adaptation and coping strategies to climate change induced shocks in North Shewa, Ethiopia. *International Research Journal of Agricultural Science and Soil Science*, 2(8): 347-36

41. Gentle, P., 2014. Changing role of local institutions to enable individual and collective actions for adapting to climate change', IASC2013 Abstracts: the 14th Global Conference of the International Association for the Study of the
42. Bamlaku, T., 2013. The impact of climate change and variability on pastoralist women in Somalia Region, Eastern and Southern Africa (OSSREA), Addis Ababa, Ethiopia. Fountain Publishers, Kampala.
43. Ellina L, Dennis T, 2006. adaptation to climate change: key terms, organization for economic cooperation and development, COM/ENV/EPOC/IEA/SLT(2006)1, OECD/IEA, France
44. Food and Agricultural Organization (FAO). 2008. Climate change and food security; a framework document, Rome
45. Chamberlin, J., 2007. Defining smallholder agriculture in Ghana: Who are smallholders, what do they do and how are they linked with markets? GSSP Background Paper 6. Washington, DC: International Food and Policy Research Institute.
46. Mphande A. 2016. Infectious disease and rural livelihoods in developing countries, retrieved from, <http://www.springer.com/978-981-10-0426-1>
47. Nnadi Ifeanyichukwu. 2015. Knowledge and Roles of Non-Governmental Organizations (NGOs) in Climate Change Mitigation and Adaptation in Anambra State. Journal of Agricultural Extension Abstracted by: EBSCO host, Electronic Journals Service (EJS), Vol.18 (2) doi.org/10.4314/jae.v18i2.13
48. Uphoff, N. and Buck, L. 2006. Strengthening Rural Local Institutional Capacities for Sustainable Livelihoods and Equitable Development. Paper prepared for the Social Development Department of the World Bank, Washington, DC, Cornell, Cornell International Institute for Food, Agriculture and Development

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