Resilience Dimensions of the Effects of Recurrent Droughts in Borana Zone, Southern Ethiopia

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Summary

A cross-sectional study was conducted in the Borana pastoralist communities to determine the magnitude of the resilience dimensions identified (*psychosocial distress, environment, wealth, infrastructure and social services, human capital, social capital and community network, peace and security, and livestock*) from the community consultation conducted in 2013. From that study, *environment* was identified as the underlying cause of drought, while *infrastructure, livestock* and *wealth* as the intermediate causes, and *human capital and psychosocial distress* were the outcome or impacts of recurrent droughts. *Social capital*, and *peace and security* were the enabling factors. Quantitative determination of the relationship of these dimensions in Borana pastoralist communities is important to undertake innovative interventions that could enhance the resilience of the community. The aim of this study was to determine the characteristics of the resilience dimensions and test the hypotheses developed from the qualitative study. Descriptive statistics, component analyses, multiple linear regression and decision tree models were applied. Scanty environmental rehabilitation activities, and scarcity of potable water sources are the major environmental and related constraints in Arero and Dhas districts. Among the studied households, 81.4% experienced displacement from their village where 76.2% is part of the family and 23.8% are whole family members left their locality. About 16% of the respondents had psychosocial distress. The main occupation of the head of the household is livestock production. Arero has relatively got better infrastructure and environmental condition compared with Dhas. An additional resilience dimension, *food insecurity*, was manifested which has a significant relationship with the rest of the dimensions. The study revealed that majority of the study communities are food insecure. Food insecurity, livestock, infrastructure, peace and security, and social capital were significant predictors of psychosocial distress and human capital. Improving the sense of peace and security condition as well as addressing food insecurity will help to improve psychosocial status and human capital of the study communities.

Acronyms

DRLA	Disaster Resilience Leadership Academy
FAO	Food and Agriculture Organization
GAR	Gross Attendance Ratio
GPI	Gender Parity Index
HFIAP	Household Food Insecurity Access Prevalence
HFIAS	Household Food Insecurity Access Scale
HoA RILab	Horn of Africa Resilient Innovation Lab
NAR	Net Attendance Ration
RAN	ResilientAfrica Network
SD	Standard Deviation
USAID	United States Agency for International Development

1. Introduction

Ethiopia is one of the countries in the Horn of Africa with a current total population estimate above 97 million (WPR, 2014). Major economic sources are agricultural products such as cereals, tea, coffee, vegetables, sheep, and cattle which have contributed the largest part of the regional growth. The agricultural sector is the major source of income for the country on which 80% of the population relies. However, the agricultural activities (livestock and crop production) are dependent mainly on rainfall. Livelihoods of most people are dependent on farming or pastoralism. Pastoralism, which is often found in lower rainfall areas, is characterized by long and short distance migration searching for pasture lands and water. As a result, welfare of pastoralist communities is directly related to environmental factors, such as scarcity of water and grazing lands which are able to pose natural threats to pastoralist livelihood systems and anthropogenic conflicts arising from competition over such scarce resources as pasture lands and water. These problems have adversely affected the communities found in pastoralist areas of Ethiopia including those in Borana Zone. Since decades, this zone has been frequently hit by recurrent droughts as well as internal and external conflicts which often followed by IDPs (ICSD, 2009).

In general, poor infrastructure development and limited connectivity; and limited institutional and human capacities, inadequate expertise, logistical shortfalls and management related problems; violent inter-clan and external conflicts; environmental degradation, aridity of the environment; recurrent droughts followed by shortage of water and pasture,; high population growth; mono livelihood; and increasing poverty have been reported as the major resilience challenges of the pastoralist communities in Borana Zone of Southern Ethiopia. The pastoralist communities' resilience to recurrent droughts has been highly destructed by environmental conditions such as deforestation, overgrazing, bush encroachment, charcoal production, water source destruction, erratic rainfall, and invasive plants.

The cultural values of the local communities have also aggravated the effects of recurrent droughts and adversely affected their resilience. Culturally, the Borana pastoralist communities value keeping high number of livestock as a sign of wealth social status symbol. In reality, however, the large number of livestock population exerts a negative pressure on the environment as it goes beyond the carrying capacity of the environment and affects the ecosystem resilience. On top of that, during drought occurrence, there will be scarcity of fodder and water which causes displacement of the local people and mobility of their livestock. These in turn provoke competition over scarce resources and conflicts that will result in loss of human lives and livestock, which ultimately result in reduction of resilience among the pastoralist communities.

Lack of good governance is the other bottleneck which was frequently raised by the study participants as affecting their resilience to recurrent droughts. There were major gaps on the parts of the government and other external bodies, such as NGOs and UN agencies in promoting good governance and stability; efforts to prevent and resolve inter-ethnic clashes and conflicts that lead to loss of human lives and livestock as well as destruction of infrastructure, including water sources; alternative provision of relief services, as well as launching of development projects that would promote the stability and resilience of Borana pastoralist communities. Frequent conflicts were associated with border delimitations which has affected a fair distribution of water sources. Other problems include lack of protection for infrastructure; hostile competitions over scarce resources and the concomitant conflicts and instability; price inflation; delay in the provision of supports during natural and human-made disasters; poor facilitation of supports from NGOs and UN agencies; and lose control over corruption.

Constraints in infrastructure and social services have also been serious obstacles to strengthening the Borana pastoralist communities' resilience to recurrent droughts. Lack of proper access to such basic social services as modern healthcare (both for humans and animals), telecommunication, electricity, road network, and wider markets have constituted the major problems of the local communities.

As most of the Borana pastoralists rely on livestock, their wealth status and livelihood become very fragile during the occurrence of drought. Due to cultural constraints, in most of the cases they do not want to diversify their means of livelihood. Such beliefs and practices make the community vulnerable to drought. Recurrent droughts cause loss of livestock, which are the main source of economic asset in the area; moreover, drought results in shortage of water and animal feed which are crucial for survival of livestock and increasing their productivity. Given that livestock was the main source of food for household, loss of livestock led to acute and chronic severe household food insecurity which in turn caused malnutrition and diseases, especially among children, women and the elderly.

In addition to the physical effects, psychosocial problems arising from recurrent droughts were found to be very rampant in the pastoralist communities. Majority of the Borana pastoralists lived under stress in fear of the occurrence of drought which would be followed by devastating effects. Psychosocial problems in the Borana pastoralist community include stress, depression, distress, anxiety, fear, mental disorder, hopelessness, and suicide in which major contributing factors are loss of livestock and other assets, substance abuse mainly due to joblessness, destruction of infrastructures, disruption of livelihood and family life, migration and conflict.

In the broader sense, household food insecurity led to increased school dropouts who in turn lowered human capital as children and youth who were pulled out of school would mean decreased literacy level, and low economic opportunities in the long term. Illiteracy, combined

with restrictive cultural norms, values and attitudes would lead to poor saving habit, limited participation in alternative livelihood opportunities and decreased household incomes. On the other hand, limited participation in alternative economic opportunities led to increased household vulnerability and has trapped them in vicious cycle of poverty. Decreased household incomes forced people to focus on charcoal production which caused deforestation and environmental degradation. Environmental degradation in turn caused climate variability, erratic rainfall, recurrent droughts which in turn reduced availability of water and animal fodder and decreasing livestock productivity. Decreased livestock productivity means reduced incomes, food insecurity, displacement, conflicts, environmentally unfriendly coping strategies, which aggravate environmental degradation and ultimately keep the Borana pastoralists in a cycle of droughts. The impact of recurrent droughts goes beyond the domain of wealth; it is also connected with psychosocial wellbeing, community networks/social capital as well as peace and security. Decreased households' wealth conditions led to increased psychosocial problems resulting from family disruption, frequent loss of livestock and other assets. On the other hand, loss of assets and increased poverty drove crime and conflicts which in turn caused stress and depression. Conversely, poor governance, accompanied by lack of peace and security, led to loss of property, assets and human life which in turn decreased wealth conditions. Similarly, decreased wealth conditions weakened community networks and relationships.

From the rapid community consultation the following resilience dimensions relationship were identified.

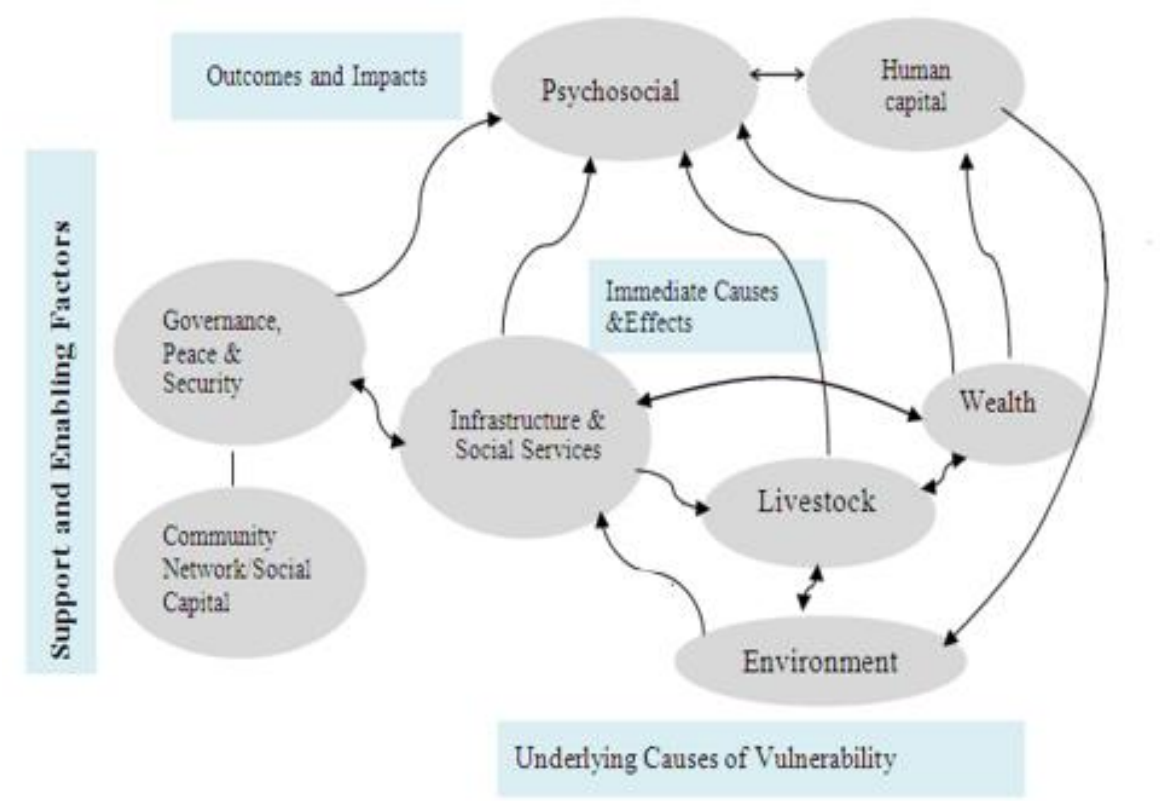


Figure1. The relationship of the resilience dimension identified from qualitative study in Borana pastoralist communities, 2013(Zewdie , Argaw, & Negalign, 2015).

However, from figure 1, it is not possible to identify whether the relationships of the dimensions are significant, or it is not possible to determine factors affecting each dimension. In addition, the impacts of the underlying and immediate causes on the outcome dimensions is not quantitatively defined.

1.1. Objectives

The main objectives of this study isto determine the characteristics of the resilience dimensions and their relationships

1.2. Specific objectives

1. To identify factors affecting human capital and psychosocial distress in the pastoralist communities of Borana Zone.
2. To identify factors affecting each of the resilience dimensions

3. To validate the relationship of the resilience dimension developed during the qualitative study.

2. Methods and materials

2.1. Study area

The study was conducted in two districts of Borana Zone, Oromia Regional State, Southern Ethiopia. During the RAN's consultative meeting held in April 2013 in Kampala, Borana Zone was proposed as a target for the RAN supported resilience programming in Ethiopia, under the HoA RILab based at Jimma University. In addition, based on the reviewed literature, Borana Zone was identified as the most drought affected pastoralist area In Ethiopia. In line with RAN's guidelines, two districts of the Zone, namely; Arero and Dhas were selected as operational sites for resilience programming, and qualitative study were already conducted in these two districts. The two districts were identified as a target for this study in consultations with local administrators taking into account the frequency and severity of drought events (Michael Odhiambo, 2012).

Arero district covers an area of 10,890km^2 and hosts a total population of about 50,000 people of which 85% are pastoralists and the remaining farmers. The district is administratively divided into 21 Kebeles (the lowest administrative unit in Oromia). This district had 30 primary schools, one junior secondary school, three health centers and 18 health posts. Only 20% of the population had access to potable water sources in the district (Arero District Planning & Economy Office, 2013). On the other hand, Dhas district stretches over an area of 3,447km^2 and hosts a total population of about 56,837 people of which 87% are pastoralists. The district is administratively divided into 12 Kebeles. In this district there are 34 primary schools, one junior secondary school, four health centers, and nine health posts. Only 15% of the population has access to potable water sources in the district (Dhas District Planning & Economy Office, 2013).

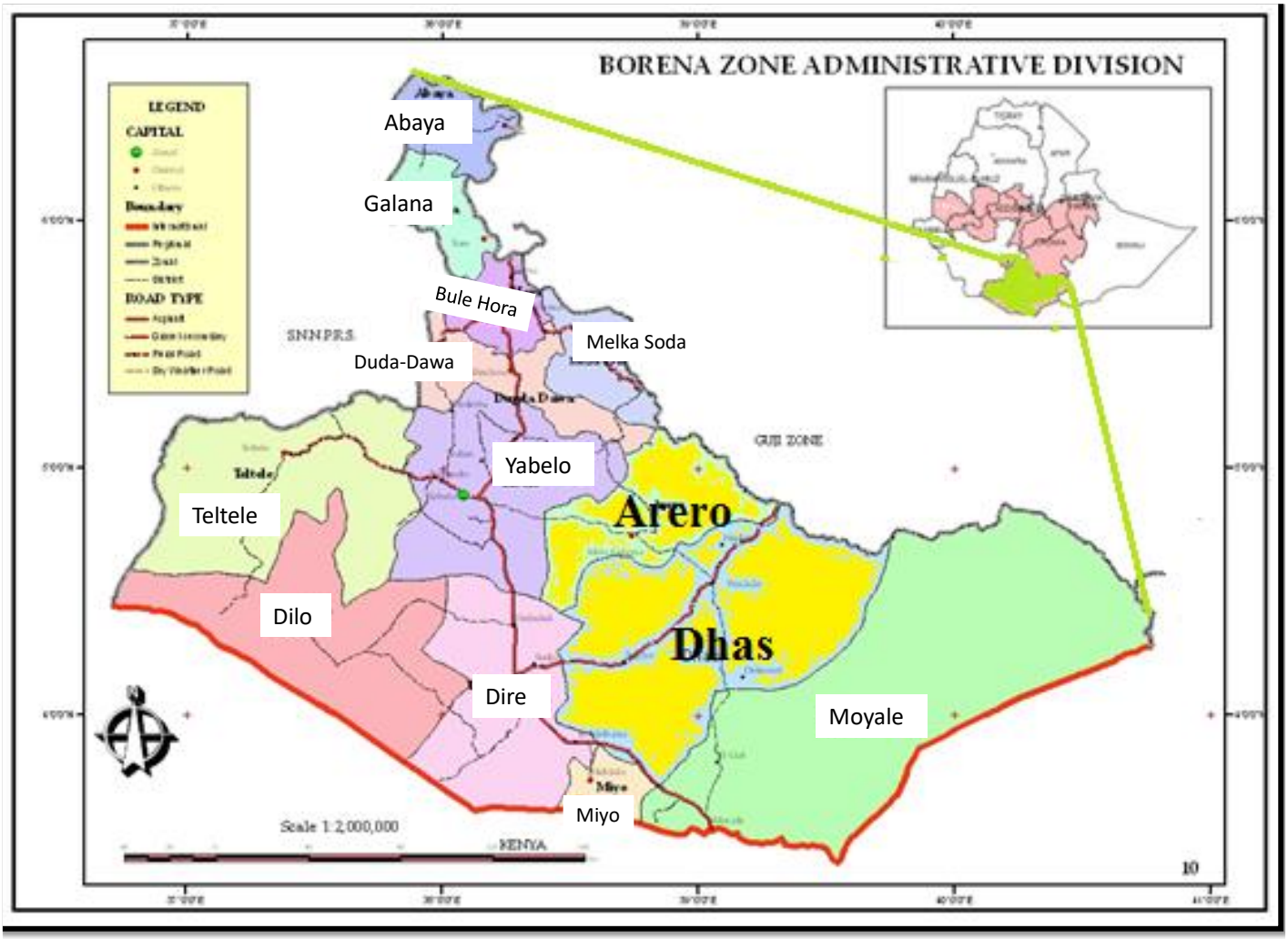


Figure2. Map of the Borana Zone

2.2. Study design

A community based cross-sectional study was conducted in the two districts (Dhas and Arero) of Borana zone.

2.3. Source population

In this study, households locatedin the two districts (Arero, Dhas) were the source population. Consequently, Arero district contained 20 kebeles and Dhas contained 11 kebeles. Two kebeles were selected from each district. 'Kebele' is the smallest administrative unit in most parts of Ethiopia.

2.4. Sample size estimation

The sample size was determined using single population proportion formula.

$$n = \frac{Z^2 p(1-p)}{e^2}$$

Where n_0 is initial sample size, Z value at 95% confidence interval and p is the proportion of the outcome variables (psychosocial distress and human capital).

Since there wasno similar previous study, a proportion of 50%, which is conservative and gives the largest sample size, was considered for any given outcome of interest. A 95% confidence interval was desired with 3% margin of error. As a result, a sample size of 1067 was needed. Adding a 10% non-response rate, the final sample size was calculated to be 1174 households. The formula and

2.5. Sampling Technique

Four kebeles (two from each district) which had been covered earlier by the rapid qualitative assessment were included in thisstudy. Accordingly, Geleba and Wachille (from Arero) as well asErder and Gorille (from Dhas) were included in the study. The sample size was allocated to the selected four kebles proportional to the total number of households in each. Within each kebele,updatedlists of all the households obtained from the Kebele administration were used as a sampling frame. Then, the desired households were randomly selected from the sampling frame.

2.6. Data collection tools

The survey data collection tools include: Household Survey Questionnaire and observation checklist.

The household survey questionnaire hadseveral sections based on the resilience dimensions included in the study. Thus, the tool contained respondents' background information, household demographic characteristics; socio-economic activities; ownership of various assets;food security scale;livestock diversity and population; infrastructures and social services;water resources, quality and utilization; psychosocial stress scale; educational status; peace and security scale;community network scale;and wealth status. The tool was adapted from standard questionnaires and some parts of the tool were further developed considering inputs from the

qualitative assessment. The tool waspretested on 5% of the sample size on households outside the target districts.

2.7. Data collectors and data collection method

Data were collected through interviewer administered questionnaire and the interviewers were withat least B.Sc.degreein public health and related fields. Local guides wereassisting the interviewers in identifying the selected households to include in the interview. The interviewswereconducted at convenient and private places. Three days training was given to data collectors and supervisors on the purpose of the study, instruments and data collection procedures. The data collection process was closely supervised by the Horn RILab research team and two immediate supervisorsfor each sub-team and district.

2.8. Data quality control

Various quality control measures were implemented to ensure the quality of the data. Experienced data collectors were recruited and in-depth training was given on how to approach and recruit respondents; interview technique and tools. Jimma University research team closely supervised the survey process. Supervisors were checking the completeness of the data on daily basis and necessary remedies were taken at field level. Epidata was used to enter the data which enables double data entry with capability of skip rules, and consistency check to control data entry error.

2.9. Data entry and statistical analysis

Data were double entered, edited and cleaned in EpiData version 3.1 and then exported to STATA 13 for analysis. Descriptive statistics were used to understand and describe the results and characteristics of dimensions and, graphs, tables and narrative text were used to present the findings. Tools used to measure each resilience dimension was subjected to Principal Component Analysis (PCA) to identify underlying component which could best represent the resilience dimension. During analysis, communality coefficient and Cronbach's alpha was used as a guidance to eliminate less contributing variables and to improve the representation of the component values. Until we obtained the best percent variability and reliability score, confusing and less contributing variables were eliminated stepwise. The factor analyses employed both

unrotated and rotated extraction methods and with Eigan values greater than one. Given that the ultimate purpose of PCA was to identify component of resilience which best represent the dimension, in each case the first component of unrotated factor was taken. This is because, unrotated component explained large percentage of the variance and also many of items were strongly associated with first component. Thus, in all cases, the greater percent variability was obtained from the first unrotated component value. Hence, the dimensions were represented by the first component values to undertake further analyses. In addition, the rotated components were also used to analyze the groupings of variables within a dimension. The first unrotated component values were used to represent the dimensions and develop the regression models. For each dimension five quantile scores were developed from the first unrotated component values to develop a decision tree.

Multivariate linear regression model was applied to test the theoretical model that explained the relationship of the dimensions and predict the two outcome dimensions (human capital and psychosocial distress). Structural equation modeling was also considered to estimate and test a network of relationships among the hypothesized resilience dimensions.

Pruned decision tree model was also constructed to predict the two outcome dimensions and identify potential intervention areas.To have reliable decision tree model, the human capital and psychosocial distress dimensionswere dichotomized into *below average* (0) and *average & above* (1); and *no distress* (0) and *distressed* (1) respectively. During model build up and model improvement process, percentage of correctly classified instances (%CCI) and Kappa statistics (K) were used.

In all bivariate and multivariate analysis, *p-value*<0.05 considered a cut-off point for statistical significance.

2.10. Ethical consideration

The study was reviewed and approved by ethics review committee of College of Health Sciences, Jimma University. Permission to undertake the study was obtained at all administrative levels. The purpose of the study was explained to each respondent and informed oral consent was obtained before the interview. Confidentiality of the information was assured for all information

provided. The right of the respondent to withdraw from the interview or not to participate was respected. All the information obtained from the respondents is used for research purpose only.

2.11. Dimension Measurement, Definitions and Analysis

To tackle the effects of recurrent drought in Borana pastoralist communities, resilience dimensions were identified. These resilience dimensions were measured using respective variables using a household data collection tool (Annex I). Different number of variables represented each dimension. Based on the respective variables, composite scores were developed to represent each dimension for further analyses.

2.11.1. Wealth

Wealth index was computed from household's possession of various assets which was assessed using 37 asset variables. The wealth index is constructed using the 37 asset indicator variables from the HH survey data. Even if, livestock could be grouped under the wealth dimension, we have excluded to determine it as a separate on due to the fact that livestock is a central issue among Borana pastoralists.

Principal component analysis was employed to obtain weight or factor score for each item. In addition, the asset variables were subjected to PCA in order to identify component of wealth which better represents the wealth index. During the analysis, asset variable with low communalities were removed from the analysis and process repeated until it provided the fewest number of components which still accounted for large percentage of the variance. In this way, three underlying components of wealth were produced and the three factors jointly explained 67.4% of the variance and the first component explained 26.05% of the variance and this factor was used to represent the wealth index. The resulting asset scores were standardized in relation to a normal distribution with a mean of zero and standard deviation of one. Each household was then assigned a score for each asset, and the factor scores were summed for each household; individuals were ranked according to the score of the household in which they resided. The sample was then divided into quintiles from one (lowest) to five (highest).

2.11.2.Livestock

This dimension of resilience captured herd size (number of all animals) and diversity. For each household, data on herd size was collected based on self-report by households and the herd size was finally presented by livestock types for each household and as related to total of each type of livestock holdings. In addition, proportion of each livestock types were computed to show the abundance or more populous type of livestock in the area. For estimation of livestock diversity, livestock ownership was classified under four main categories or classes. Class I: Cattle (such as oxen, cows, calves, etc.), Class II (goats and sheep), ClassIII: Camels, mules, horses, and donkeys and Class IV poultry (chickens). Consequently, livestock diversity was defined ashousehold ownership of at least two of the aforementioned classes.

2.11.3.Community Network/Social Capital

Initially 24 items, on three point original scale from agree (2) to disagree (0) and uncertain or don't know (1), were used to measure community network or social capital in the study communities. The items were subjected to PCA to uncover the underlying principal component that could best represent this resilience dimension. The analysis revealed that there were three underlying components and the three components jointly explained 64.80% of the variance in community networks. Items with weak communalities were removed from the analysis and consequently 20 items were retained in the final component analysis (table 9). Given that the first factor explained large percentage of the variance, it was chosen to represent the social network dimension of resilience. The first factor component without rotation explained 45.23% of the variance. The first component also is positively associated with all of the contributing variables. Of the retained 20 items, 15 items were strongly and positively loaded to this factor component with minimum factor loading of 0.533 which indicates an overall strong first component and good candidate for a composite social capital score. The scale was highly internally consistent (Cronbach's Alpha=0.946). The three components among the rotated and unrotated factors categorized the dimension variables similarly. Hence we didn't include the rotated component results in table 9.Accordingly, the items summed up to produce composite score with range of possible values between 15-30 scores.

2.11.4.Peace and Security

Six items were used to assess people's perceptions of peace and security on three point ordinal scale that ranged from low (1) to high (3). The items were undergone PCA and it revealed that the items measured a single dimension of peace and security and all items had high loadings. This factor explained 69.2% of the variance in the variable of interest. The scale was internally

consistent (Cronbach's Alpha=0.91). The scale was summed up to produce composite index with possible range of score 6-18. The higher the score the higher level of peace and security and vice versa.

2.11.5.Human Capital

This dimension was represented by educational status and factors related to education.

Educational Achievements: Population literacy was used to indicate or measure study population's educational achievements. In this study, educational achievement was considered for all household members age ≥ 5 years and individual who attended any formal school and at least completed grade 1, according to Ethiopian education system, considered as literate and otherwise, illiterate. The indicator was segregated by age and sex.

2.11.5.1. School Attendance Indicators

Net Attendance Ratio (NAR): The NAR for primary school is the percentage of the primary-school-age (7-12 years) population that is attending primary school during the survey. And the NAR for secondary school is the percentage of the secondary-school-age (13-18 years) population that is attending secondary school. By definition, the NAR cannot exceed 100 percent.

Growth Attendance Ratio (GAR): GAR for primary school is the total number of primary school students, expressed as a percentage of the official primary-school-age population. And the GAR for secondary school is the total number of secondary school students, expressed as a percentage of the official secondary-school-age population.

The NAR indicates participation in primary schooling for the population age 7-12 and secondary schooling for the population age 13-18. The GAR measures participation at each level of schooling among those of any age. The GAR is nearly always higher than the NAR for the same level because the GAR includes participation by those who may be older or younger than the official age range for that level. An NAR of 100 percent would indicate that all those in the official age range for the level are attending at that level. The GAR can exceed 100 percent if there is significant overage or underage participation at a given level of schooling.

Gender Parity Index (GPI): The gender parity index for primary school is the ratio of the primary school GAR for females to the GAR for males. And the gender disparity index for secondary school is the ratio of the secondary school GAR for females to the GAR for males.

The GPI represents the ratio of the GAR for females to the GAR for males and it provides a summary measure of gender differences in school attendance rates. A GPI less than one indicates that a smaller proportion of females than males attend school.

2.11.6.Infrastructure

Ten items were used to undertake factor analyses and select the representative variables. Items, such as distance to the nearest health facility (negative values), livestock service (e.g. presence of livestock clinic, and professionals), factors related to livestock feed, and access to water sources were the major items. After the dimension reduction, based on the Cronbach's alpha (> 0.5) and improvement on % variability of the component values, seven items were representing the dimension.

2.11.7.Psychosocial Distress

Based on the SRQ-F psychosocial measurement, 29 items were used to determine this dimension. To determine the psychosocial distress level, scores (yes=1) were summed up and those individuals scored seven or above are considered psychosocially under distress. During the factor analyses and stepwise removal of items, only ten variables were remained to represent the dimension.

2.11.8.Environment

The keyfactors that affect the environment were used to represent this dimension. The major environmental constraint in Borana pastoralist communitiesare resources related to water. Water resourceswere the main variables used in the factor analyses to represent the dimension. In addition, family size and livestock size of households were used as both exert pressure on the environment.To avoid overlap and duplication, these variables were not used to determine any other dimension. Based on the factor analyses, this dimension was finally represented by four items.

2.11.9.Household Food insecurity

Household food insecurity was assessed using household food insecurity access scale (HFIAS)[i]. The scale consisted of nine occurrence questions-that is, whether the condition in the question happened at all in the past four weeks (yes or no). The respondent was first asked an occurrence

question –If the respondent answered "yes" to an occurrence, a frequency-of-occurrence question was asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks. The HFIAS score shows the degree of food insecurity (access) in the household in the past four weeks or 30 days. The HFIAS composite score was computed for each household by summing up the codes for each frequency-of-occurrence question. During computation, code frequency-of-occurrence was assigned '0' for all respondents where the answer to the corresponding occurrence question was "no". The score ranged from 0-27 and the higher the score, the more food insecurity (access) the household experienced and vice versa.

Household Food Insecurity Access Prevalence (HFIAP): The HFIAS would help to compute Household Food Insecurity Access Prevalence **(HFIAP**). Given that the average HFIAS score is a continuous variable, it is more sensitive to capturing smaller increments of changes over time than the HFIAP indicator. Therefore, the HFIAP indicator should be reported in addition to, rather than instead of, the average HFIAS Score for program monitoring and evaluation. Consequently, the HFIAP indicator categorized households into four levels of household food insecurity (access). The categorization scheme was designed to ensure that a household's set of responses will place them in a single, unique category.

Table 1: Categories of household food insecurity and their descriptions

Food insecurity status	Definitions
Food secure household	Food secure household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely.
Mild food secure household	Mild food insecure household- worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. But it does not cut back on quantity nor experience any of three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating).
Moderately food insecure household	A moderately food insecure household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods

	sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions.
Severely food insecure household	A severely food insecure household has revertedto cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure.

2.11.10. Data quality control

Various quality control measures were implemented to ensure the quality of the data. Experienced data collectors were recruited and in-depth training was given on how to approach and recruit respondents; interview technique and tools. Jimma University research team closely supervisedthe survey process. Supervisors were checking the completeness of the data on daily basis and necessary remedies were taken at field level. Epidata wasused to enter the data which enables double data entry with capability of skip rules, and consistency check to control data entry error.

3. Results

3.1. Socio-demographic characteristics of survey respondents

In this study, 1058 respondents participated, making a response rate of 90.0%. In these surveyed households, 6051 household members were living. Table 2 shows background characteristics of the survey respondents. Accordingly, the mean and median age of the respondents was 38.93 (SD=17.4) and 35 years respectively. Six hundred seventy two (63.5%) of the respondents were female. In terms of educational status, large majority (83.1%) of the respondents cannot read and

write. Waqefenna[1] was the dominant religion in the study communities, represented by 647 (61.2%) of the survey respondents.

Table 1. Socio-demographic characteristics of survey respondents, Borana, August 2015.

Background Variables	Category	Arero		Dhas		total
		n	%	n	%	%
Sex	Female	239	53.7	433	70.6	63.5
	Male	206	46.3	180	29.4	36.5
Education	Formal education	118	26.5	39	6.4	14.8
	Can read and write but no formal education	10	2.2	12	2.0	2.1
	Cannot read and write	317	71.2	562	91.7	83.1
Marital status	Single	13	2.9	29	4.7	4.0
	Married	373	83.8	499	81.4	82.4
	Widowed	38	8.5	67	10.9	9.9
	Divorced	21	4.7	18	2.9	3.7
Religion	Waqefenna	178	40.0	469	76.5	61.2
	Orthodox	11	2.5	3	0.5	1.3
	Muslim	134	30.1	85	13.9	20.7
	Protestant	121	27.2	56	9.1	16.7
	Others	1	0.2	0	0.0	0.1
	15-24	94	21.1	11	19.4	20.1

[1] An indigenous religion, which means believing in God.

Background Variables	Category	Arero		Dhas		total
Age of the respondent in years	25-34	128	28.8	179	27.7	28.2
	35-44	95	21.3	111	18.1	19.5
	45-54	53	11.9	74	12.1	12.0
	55-64	31	7.0	64	10.4	9.0
	≥65	44	9.9	75	12.2	11.2

3.2. Household Population

The total population counted in the surveyed households was 6051, with 3118 males and 2933 females, producing an overall sex ratio of 101 males per 100 females. The sex and age distribution of the population is shown in the population pyramid in figure 1. The age structure of the household population is typical of a society with a youthful population, indicating a feature of populations with high fertility levels. The broad base of the population pyramid depicted below shows that a significant proportion of the study population is below age 15. The average household size was 5.77 (SD=2.28) (range 1-16) (Figure 3).

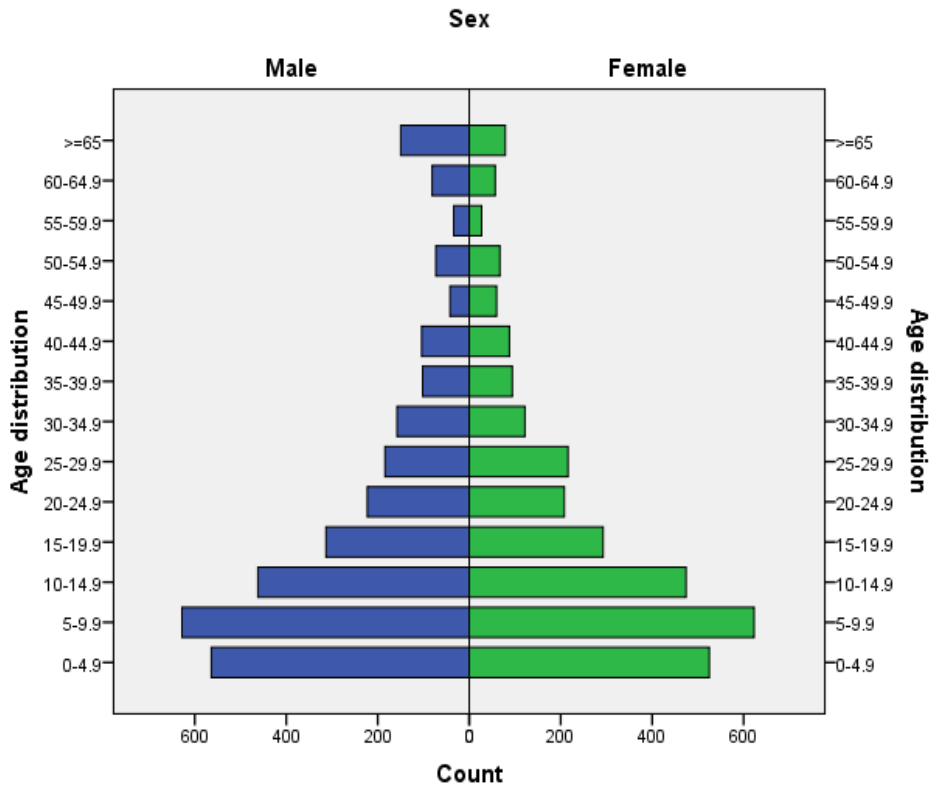


Figure 3. Population pyramid of the study communitiesinArero and Dhas districts of Borana Zone, 2015

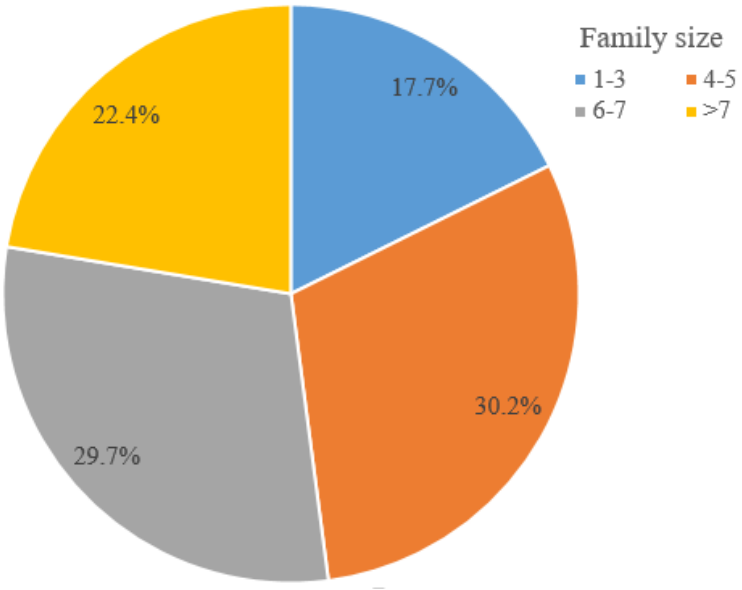


Figure 4. Household family size distribution in the study area of BoranaZone, 2015

3.3. Household Economic Activity

Table 3shows major economic activities of heads of households in the study population. Accordingly, majority (77.6%) of the heads of the households' engaged in livestock production or livestock rearing. The proportion of heads who were involved in livestock productionas means of livelihood was higher in Dhas district (86.8% in Dhas Vs 64.9% in Arero). As displayed in table 3, head of households were engaged in less diversified economic activities.

Table 2. Heads of households economic activitiesinArero and Dhas districts ofBorona Zone, 2015

Main economic activitiesof the HH heads	Arero		Dhas		Total	
	N	%	n	%	n	%
Livestock production	289	64.9	532	86.8	821	77.6
No job	32	7.2	30	4.9	62	5.9
Crop farming	23	5.2	14	2.3	37	3.5
Causal worker or daily laborer	29	6.5	6	1.0	35	3.3
Shop or market	25	5.6	6	1.0	31	2.9
Small business	21	0.7	2	0.3	23	2.2
Herder	6	1.3	17	2.8	23	2.2
GO or NGO employed	11	2.5	5	0.8	16	1.5
Charcoal or firewood production	6	1.3	0	0.0	6	0.6
Students	3	0.7	1	0.2	4	0.4
Total	445		613		1058	

Table 4 presents major and secondary economic activities of household members whose age was ≥5 years among surveyed households by sex. Consequently, overall more than half, 2661 (53.6%) of the household population was involved in livestock related activities as a major meansof livelihood and 995 (20.1%) were students. On the other hand, 755 (15.2%) of the household population did not have any job. Likewise, 3,588 (72.3%) of the household population did not have any secondary economic activities, and only 959 (19.3%) of the population engaged in agricultural farming as second major activity. The result showed that household population in the study communitieswereengaged in limited and less diversified economic activities (Table 4).

Table 3. Economic activities of household population, in the study area of BoronaZone, 2015

Household main economic activities	Male		Female		Total	
	N	%	n	%	n	%
Livestock production	1539	60.2	1122	46.6	2661	53.6
Students	508	19.9	487	20.2	995	20.1
No job	287	11.2	468	19.4	755	15.2
Crop farming	64	2.5	24	1.0	88	1.8
Shop or market	39	1.5	37	1.5	76	1.5
Causal worker or daily laborer	49	1.9	20	0.8	69	1.4
Small business	22	0.9	42	1.7	64	1.3
GO or NGO employed	28	1.1	6	0.2	34	0.7
Charcoal/wood production	2	0.1	19	0.8	21	0.4
Gum production	2	0.1	7	0.3	9	0.2
Poultry production	0	0.00	2	0.1	2	0.1
Others	14	0.5	174	7.2	188	3.8
Second major economic activities						
No other economic activity	1722	67.4	1866	77.5	3588	72.3
Crop farming	593	23.2	366	15.2	959	19.3
Herder	124	4.9	60	2.5	184	3.7
Livestock production	53	2.1	48	2.0	101	2.0
Others[2]	62	2.5	68	2.8	130	2.6
Total	2554	100.0	2408	100.0	4962	100.0

[2]Small business, Shop or market, Student and in school, Causal worker or daily laborer, Gum production, Charcoal or fire wood production, Poultry production, Bee production, GO or NGO employed

3.4. Characteristics of resilience dimensions

3.4.1. Wealth

3.4.1.1. Household asset possessions

Table 5 presents information on ownership of durable goods and other possessions and possession by wealth quartiles. The results showed that 87.24% of the households had livestock; 77.79% had owned Axe, and 77.69% had chair. Possession of livestock, axe, chair, crop farming, and machete (Gejera) were highest among households with highest wealth quartile (Table 5).

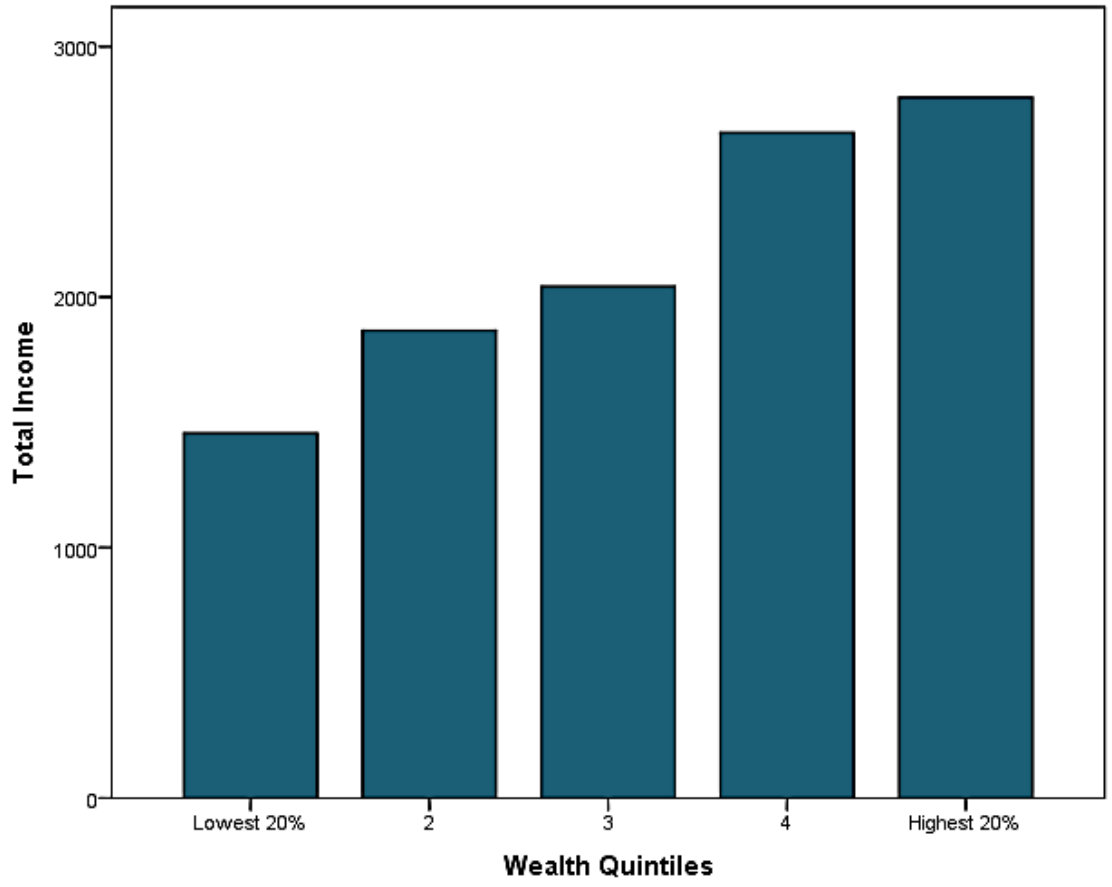
Table 4. Household ownership of assets in the study districts of Borana zone, 2015

Indicator variables	District		Total	Possession by wealth quintile				
	Arero (n=445)	Dhas (n=613)		Lowest	Second	Middle	Fourth	Highest
Livestock	80.4	92.1	87.2	17.3	18	16.7	17.7	17.6
Axe	76.6	78.6	77.7	12.9	17	15.7	15.2	16.9
Chair	68.3	84.5	77.6	14.1	16.2	14.7	16	16.8
Agricultural land	53.2	83.0	70.5	12.7	15.9	13.7	14.4	13.9
Machete(Gejera)	52.8	54.3	53.6	4.5	12.6	10.2	10.5	15.9
Mobile telephone	44.4	53.8	49.9	8.8	10.8	9.5	10.3	10.5
Chickens	31.4	59.3	47.6	8.8	10.9	8.6	9.5	9.8
Kitchen	44.4	40.1	41.9	5.7	8.4	7.6	9.5	10.9
Toilet	34.8	45.6	41.1	5.4	6.8	9.4	9.5	10.1
Blanket/Gabi	31.9	40.2	36.7	2.7	9.9	7.8	6	10.4
Sickle(Machid)	18.8	49.1	36.3	2.9	9.7	6.4	6.9	10.4
Kerosene/pressure lamp	19.5	37.1	29.7	5.3	7.4	5.5	5.6	6.0
Hayfield	26.9	31.0	29.3	3.3	5.7	6.1	6.2	7.9
Pasture land	12.5	21.0	17.4	0.9	2.8	2.9	3.5	7.4
Bed with mattress	21.5	13.8	17.1	3	2.9	2.8	2.6	5.8
Radio/Tape	24.7	10.2	16.3	2.6	2.9	3.2	2.9	4.6
Table	18.2	11.0	14.0	2.1	2.4	2.9	2.8	3.9
Watch/clock	19.5	9.4	13.7	2.6	1.8	3.6	3.2	2.5
House in town	22.7	3.4	11.5	0.7	1.7	2.4	2.2	4.6
Jewels (Gold and silver)	11.6	9.1	10.2	0.6	2.2	2.5	2.2	2.8
Riffle/Gun	11.0	7.6	9.0	0.5	2	1.2	1.8	3.6
Beehives	16.4	1.3	7.6	1.4	0.9	1.8	1.4	2.1
Shelf	11.4	2.9	6.5	0.1	0.6	0.9	1.3	3.6
Forage	5.6	3.7	4.5	0	0.9	1.2	1.5	0.9
Motorcycle	3.6	1.6	2.4	0.1	0	0.6	0.9	0.9
Non-mobile telephone	2.0	2.6	2.3	0.2	0.4	0.5	0.8	0.6
water supply	1.8	2.1	1.9	0.4	0.3	0.5	0.4	0.5
water storage pit	2.9	1.3	1.9	0	0.1	0.7	0.1	1.1

Indicator variables	District		Total	Possession by wealth quintile				
	Arero (n=445)	Dhas (n=613)		Lowest	Second	Middle	Fourth	Highest
Television	1.8	1.6	1.7	0.4	0.3	0.3	0.3	0.5
Electric mitad (baking pan)	1.1	1.3	1.2	0	0.2	0.3	0.4	0.4
Electricity	1.8	0.0	0.7	0	0.1	0.2	0.2	0.3
gas/electric stove	0.6	0.8	0.7	0	0.2	0.3	0.1	0.2
Sewing machine	1.3	0.0	0.5	0	0	0.1	0.2	0.3
Refrigerator	0.6	0.1	0.3	0.1	0	0	0.1	0.2
Bicycle	0.4	0.3	0.3	0	0.1	0	0.1	0.2
Animal-drawn cart	0	0.3	0.1	0	0	0	0	0.2
Car		0.0	0.2	0	0	0	0.1	0.1

3.4.1.2. Wealth index

Figure 5. Income level and relative wealth under different wealth quintiles in the study communities of Borana zone, 2016



Based on the principal component analyses, the first unrotated component represents 26% variability while the rotated one 24.7% variance. Except the first component, which represents the land ownership, others have no clear patternin variable grouping (Table 6).

Table 5. Rotated and unrotated component matrixes of the wealth dimensionin the study communities of Borana zone, 2016

	Unrotated			Rotated		
Selected variables	Comp1	Comp2	Comp3	Comp1	Comp2	Comp3
HH ownership of pasture land	0.754		-0.351	0.864		
HH ownership of hayfield	0.794			0.851		
HH ownership animal-drawn cart			0.7		0.827	
HH ownership of water source		0.778			0.815	
HH ownership of sewing machine	0.329	0.751				0.764
HH ownership of forage	0.339		0.696			0.776
% variance	**26.046**	**22.078**	**19.311**	**24.733**	**22.53**	**20.172**

3.4.2. Household Food Insecurity

The analysis indicated that mean household food insecurity score was 18.2 (SD=7.4, Min=0, Max=27) which was quite high indicating large proportions of the households were in a state of food insecurity. Figure 5 shows kernel density estimate for the food score and indicated that large number of households scored around 20 out of 27 possible score values suggesting that large number of households faced high food insecurity. The HFIS score was skewed to the right indicating that large number of households were in a state of food insecurity.

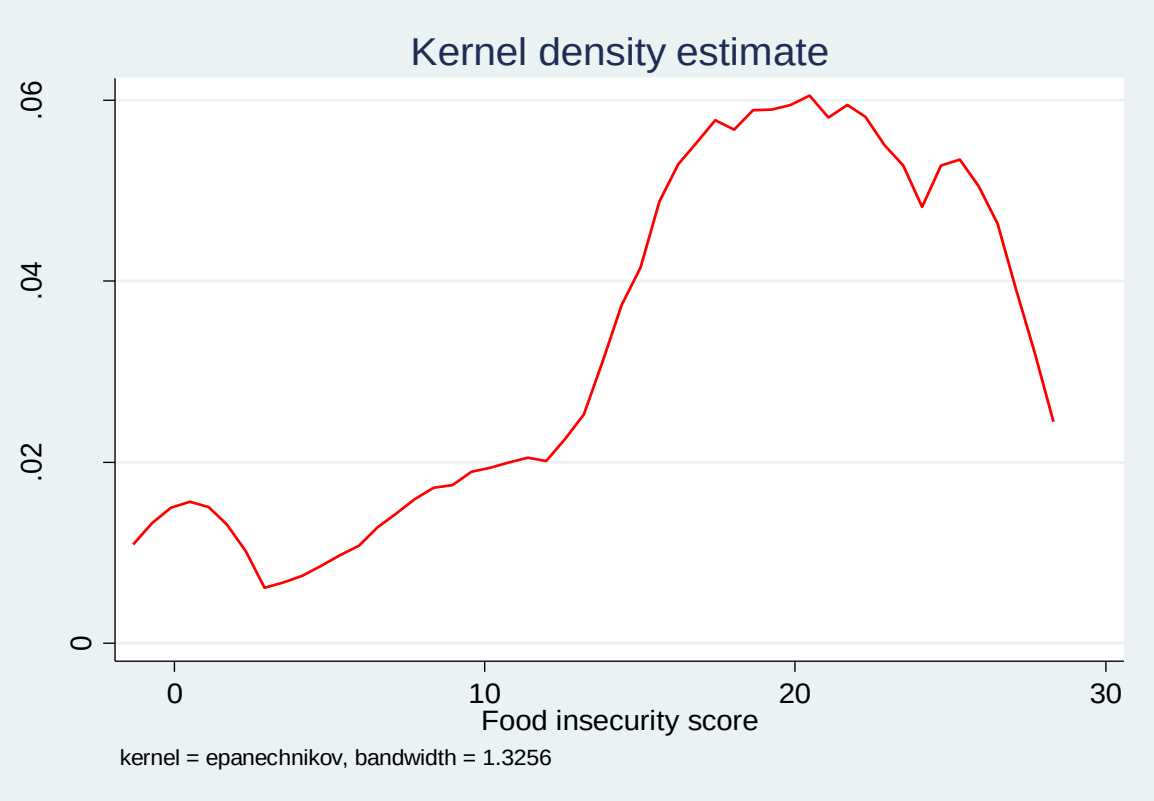


Figure 6. Kernel density estimate for food insecurity score for the study community, Borana zone, 2015

3.4.2.1. Household Food Insecurity Prevalence

Table 6. Household food insecurity prevalence in the study area. Overall, 82.3% of the households were in the state of severely food insecure and 14.6% were moderately food insecure. The proportions of households with severe food insecure was similar across study villages, but slightly highest in Wachille (89.2%) and lowest for Erdar (75.8%). Most, importantly, the proportion of food secure households wasalmost nil.

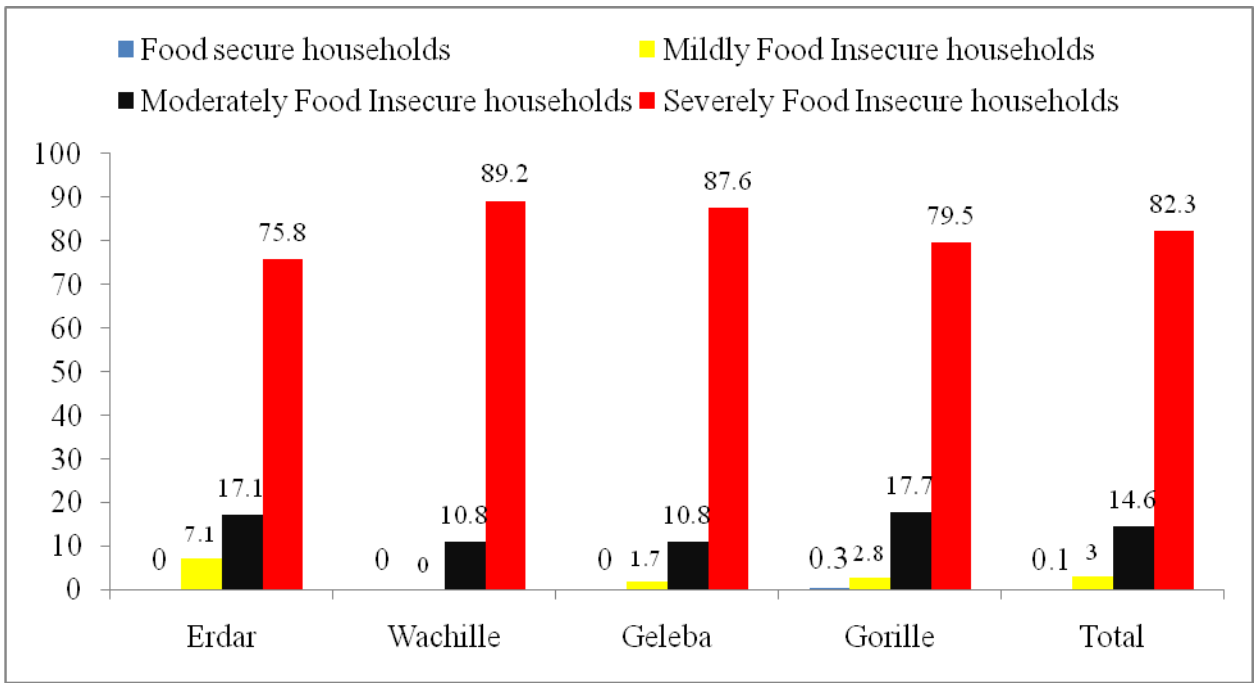


Figure 7.Household food insecurity category among households in study area, Borana, 2015

3.4.2.2. Component analysis of food insecurity dimension

Factor analyses based on food insecurity variables indicated that the dimension was represented by two components which has a cumulative variance of 73% where first unrotated component represented 59.1% of the variance. The first component of the rotated matrix represented mainly food shortage while the second component dealt with absence of food. The first unrotated component was used to represent the dimension as it represents the highest variance than the other component values (Table 7).

Table7. Factor scores of the different components of food insecurity variables in the two districts of Borana zone, 2016

Variables selected	Unrotated		Rotated	
Cronbach's Alpha = 0.91	Comp1	Comp2	Comp1	Comp2
How often were you or any household member not able to eat the?	0.7917		0.8524	
How often did you or any household member have to eat limited?	0.7676		0.8486	
How often did you or any household member have to eat smaller?	0.8321		0.8062	
How often did you worry that your household would not have enough food?	0.7624		0.7692	

How often did you or any household member have to eat fewer m?	0.8339		0.7373	
How often did you or any household member have to eat some foo?	0.7073		0.5906	
How often did you or any household member go to sleep at night without eating food?	0.7383	0.5486		0.8838
How often did you or any household member go a whole day and night without eating food?	0.6860	0.5875		0.8831
How often was there ever no food to eat of any kind in your household?	0.7845	0.4098		0.8014
% variance explained	59.1	13.9	42.5	30.5

3.4.3. Livestock

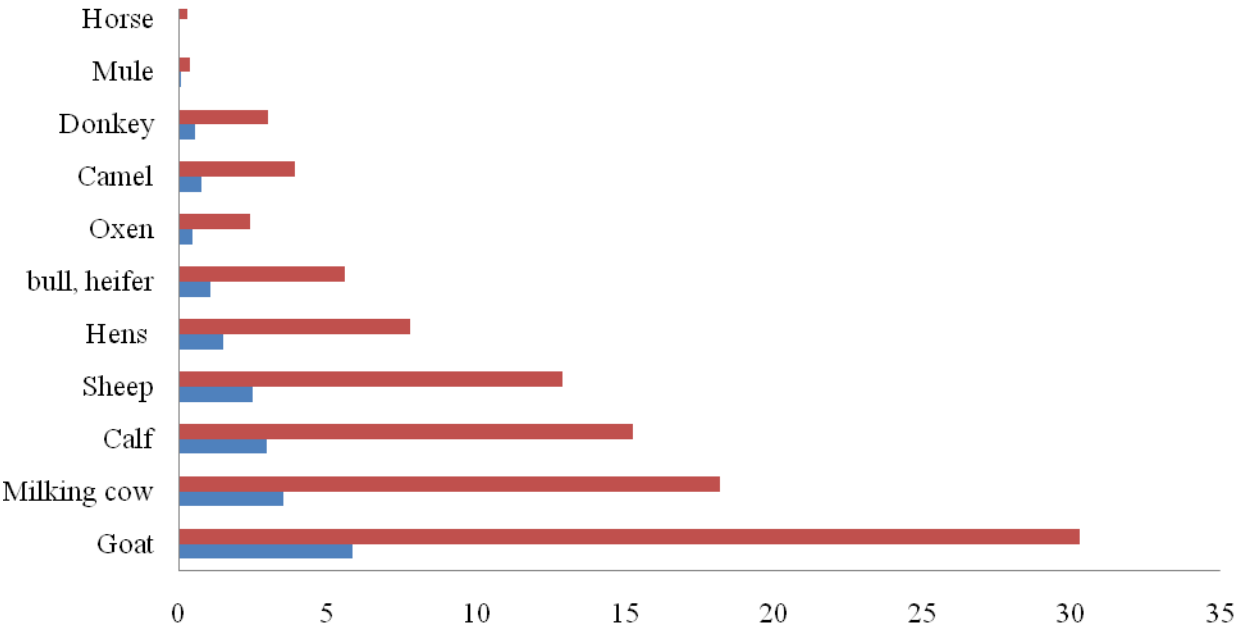
Overall**,** 1008 (95.3%) of the studied households had at least one typeof livestock. Table 8 presents livestock holdings by type in each district. Regarding livestock ownership in the area, majority (87.0%) of the households had milking sand followed by goats which accounted for78.4%. In general, 20,503 animals of various types were reported, making 19.4 animal per household. Figure 7 shows weighted proportion of each type of livestock. Consequently, goats and milking cowswerethe most prevalent livestock types in the area which accounted for 30.3% and 18.2% respectively.

Table 8. Livestock holdings by type in the Arero and Dhas districts of Borana zone, 2016

Livestock types	Arero	%	Dhas	%	Both	%	Total livestock accessed	Mean
Oxen	19	4.3	236	38.5	255	24.1	483	0.46
Milking cows	364	81.8	556	90.7	920	87.0	3740	3.53
Calves	292	65.6	524	85.5	816	77.1	3136	2.96
bulls, heifers	133	29.9	223	36.4	356	33.6	1157	1.09
Goats	287	64.5	543	88.6	830	78.4	6211	5.87
Sheep	166	37.3	369	60.2	535	50.6	2642	2.50
Camels	103	23.1	178	29.0	281	26.6	801	0.76
Mules	10	2.2	44	7.2	54	5.1	79	0.07
Donkeys	123	27.6	254	41.4	377	35.6	613	0.58
Horses	9	2.0	12	2.0	21	2.0	52	0.05
laying hens	107	24.0	309	50.4	416	39.3	1159	1.10
non-laying	69	15.5	148	24.1	217	20.5	430	0.41

Livestock types	Arero	%	Dhas	%	Both	%	Total livestock accessed	Mean
Hens	176	39.6	457	74.6	633	59.8	1589	1.50

In the Arero and Dhas districts the largest livestock population was that of goats, followed by milking cows. Figure 7 describes proportional distribution of the different livestock types.



	Goat	Milking cow	Calf	Sheep	Hens	bull, heifer	Oxen	Camel	Donkey	Mule	Horse
Proportion	30.3	18.2	15.3	12.9	7.8	5.6	2.4	3.9	3	0.4	0.3
Mean	5.87	3.53	2.96	2.5	1.5	1.09	0.46	0.76	0.58	0.07	0.05

Figure 8. Mean livestock (per household) and proportions (specific livestock/total livestock)

As indicated in figure 8, overall 88.4% of the households had any cattle whereas 81.7% of the households had owned goat/sheep. Livestock categories such as camels, mules, horses, donkeys and poultry were less common.

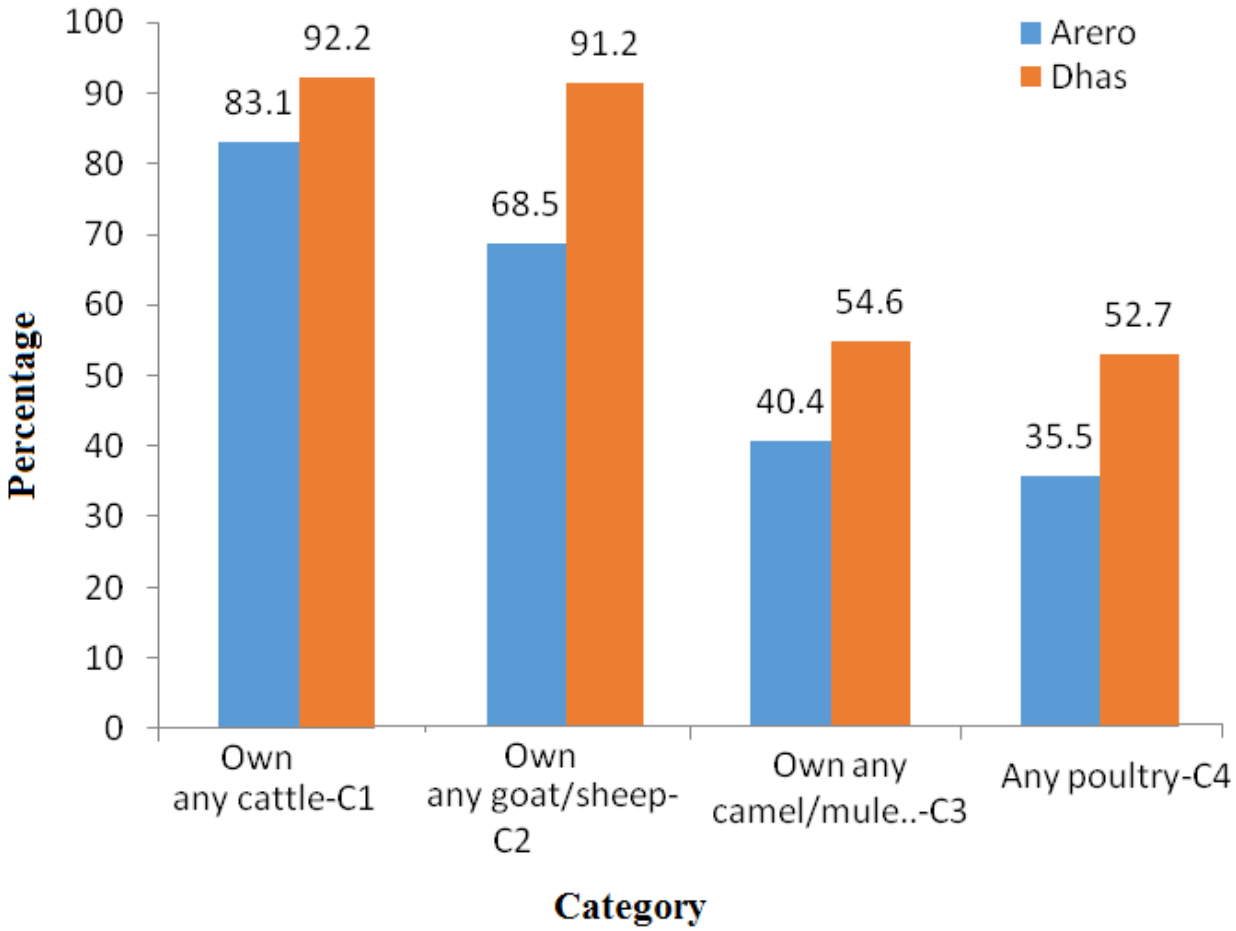


Figure 9. Proportions of households owning various types of livestock by district.

As displayed in figure 9, 5.9% of the households did not have any livestock and 9.0% of the households kept only one type of livestock, and the proportions of households that kept two livestock typeswere 24.7%, and overall 24.4% of the households owned livestockfrom each of the four categories indicating moderatelivestock diversity.

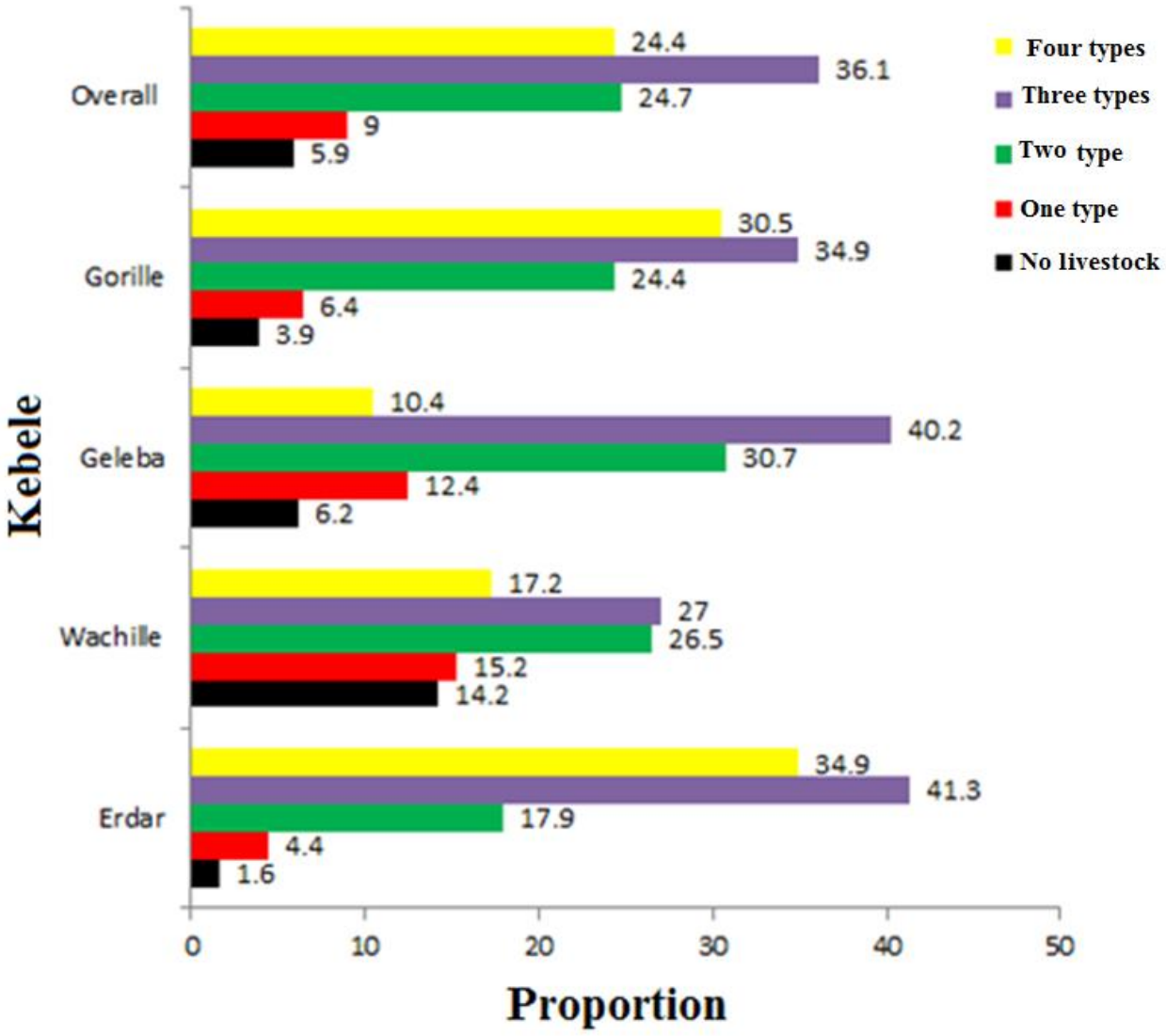


Figure 10. Level of diversity of livestock ownership by study Kebeles, Borana zone, 2015

3.4.3.1. Component analysis of livestock dimension

Principal component revealed that livestock indicator variables can be grouped into four meaningful underlying components. The four components jointly explained 72.84% of the variance in livestock dimension of resilience, and the first component explained 33.0% of the variance. The first unrotated component was higher than the rotated percent variability, thus, the first component was selected to represent livestock dimension (Table 8).Among the rotated components livestock were categorized into higher animals comprising 24.3% variability, goat and sheep, chicken and horse (a rarely owned livestock).

Table 9. Factor scores of the different components of livestock variables in the two districts of Borana zone, 2016

Variables selected	Unrotated				Rotated			
	Comp1	Comp2	Comp3	Comp4	Comp1	Comp2	Comp3	Comp4
Number of mules	0.495		0.606		0.807			
Number of milking cows	0.805				0.796			
Number of donkeys	0.733				0.704			
Number of calves	0.752				0.596			
Number of sheep	0.588		-0.495			0.798		
Number of goats	0.664		-0.434			0.789		
Number of non-laying hens		0.747	0.372				0.883	
Number of laying hens	0.347	0.789					0.818	
Number of horses				0.927				0.976
% variance explained	33.021	16.351	12.228	11.236	24.278	20.494	16.561	11.504

3.4.4. Community Network

The result showed mean score was 24.46±8.39, and median value of 28.00; t-test analysis indicates that there was mean difference by district (p=0.001), with significantly (p=0.001) higher mean score in Dhas (mean=25.21) than Arero (mean= 23.44). The second component is related to indigenous social support institution 'Busa Gonofa' and this factor explained 12.06% of the variance, and last component captured the influence or role of external system such as governance and external aid in community network which accounted 7.45% of the variance. The first component was considered to represent the dimension.

Table 10. Factor loading matrix for community networks scale, 2016

Selected variables (Cronbach's alpha = 0.89)	Unrotated			Rotated		
	Comp1	Comp2	Comp3	Comp1	Comp2	Comp3
In this community, better families are are willing to share milk and milk	0.835			0.846		
Most people in this community are willing to help if you need it	0.859			0.846		
In this community, drought affected families would get goood support from	0.839			0.845		
In this community, people are willing to share food or any items at the ti	0.839			0.843		

Selected variables (Cronbach's alpha = 0.89)	Unrotated			Rotated		
	Comp1	Comp2	Comp3	Comp1	Comp2	Comp3
Community members are willing to help each other at the time of crisis (eg	0.828			0.839		
Better families are willing to loan milk cows to drought affected families	0.810			0.816		
If you suddenly faced a long-term emergency such as drought crisis, peopl	0.811			0.799		
If something unfortunate happened to someone in this community, such as se	0.791			0.794		
If someone suddenly needed a small amount of money, many people could be	0.804			0.786		
In this community, families who lost their livestock due to drought are re	0.771			0.755		
People can depend on each other in this community	0.727			0.741		
If my neighbour faces a problem, such as lost his/her livestock and asset	0.679			0.688		
Members of this community help each other during shock or stress	0.631			0.621		
Members of this community are willing to share resources needed for lives	0.643			0.616		
Peple willing to contribute for Busa Gonofa has decreased		0.848			-0.886	
Compared to five years ago, the support provided by Busa Gonofa has been		0.823			-0.850	
People willing to join Busa Gonofa has been decreased over the past five		-0.757			0.835	
Over the last five years, the level of support in this community has gott	0.533				0.551	
Modern governance structures negatively affected the culture of social su			0.810			0.865
External aid degraded the culture of social support in this community			0.807			0.863
% variance	**45.3**	**12.1**	**7.5**	**43.4**	**13.3**	**8.0**

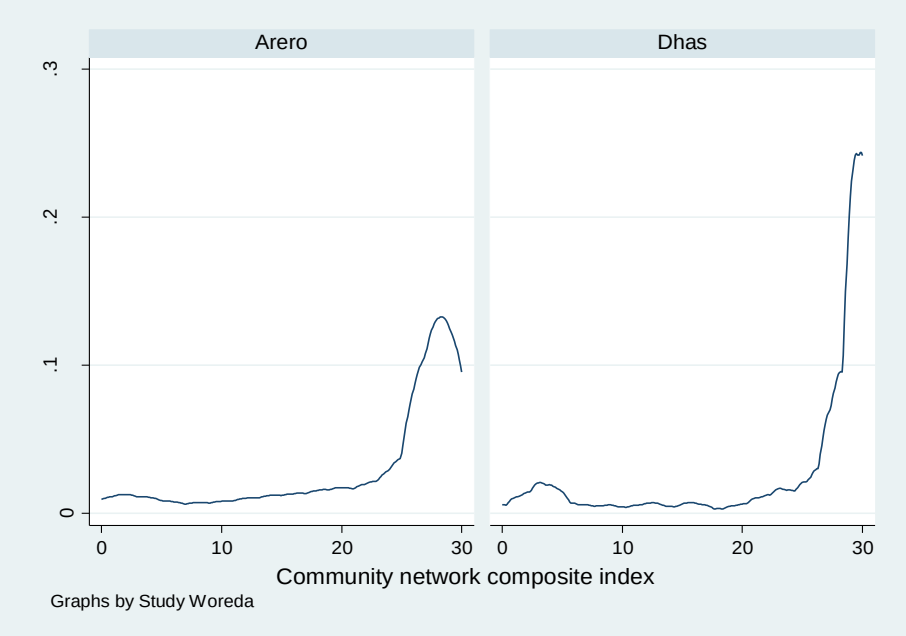


Figure 11. Kernel density indicating composite index by study district, Borana zone, 2016

As depicted in figure 10, the score was skewed to the right side which indicates strong social support tradition in the study community.

3.4.5. Peace and Security

The mean score of peace and security scale was 14.82 (SD=3.69). The higher the score indicates the higher perception of peace and security. Table ten indicates factor loading matrix and indicates that all items were strongly loaded to the first component.

Table 10. Factor loading of the variables for peace and security in Borana zone, 2016

Items	Comp1
Rating of peace among inter-group in this area	0.88
Rating of your own sense of security in this community	0.87
Rating of the extent of peace in your area	0.85
Rating of the peace between different ethnic groups in this area	0.82
Rating of government's response during conflict	0.79
Rating of Gada system's role in resolution of local conflict	0.73

ANOVA and t-test results showed that there was statistically significant mean difference on peace and security score by study district and kebeles (p=0.001) (table 11). Consequently, perception of peace and security was significantly low in Geleba and Wachille kebeles. Likewise, Arero district was more affected by lack of peace and security (Figure 11).

Table 11.Mean score for peace and security scale, segregating by sex, districtand kebele

Selected background characteristics	Category	Mean	SD	p-value
Sex of respondents	Male	14.00	3.90	
	Female	15.29	3.49	0.001
District	Arero	11.85	3.56	0.001
	Dhas	16.97	1.83	
Kebeles	Gorille	15.00	1.16	
	Erdar	16.00	2.02	
	Wachille	11.63	3.51	0.001
	Geleba	11.36	3.57	

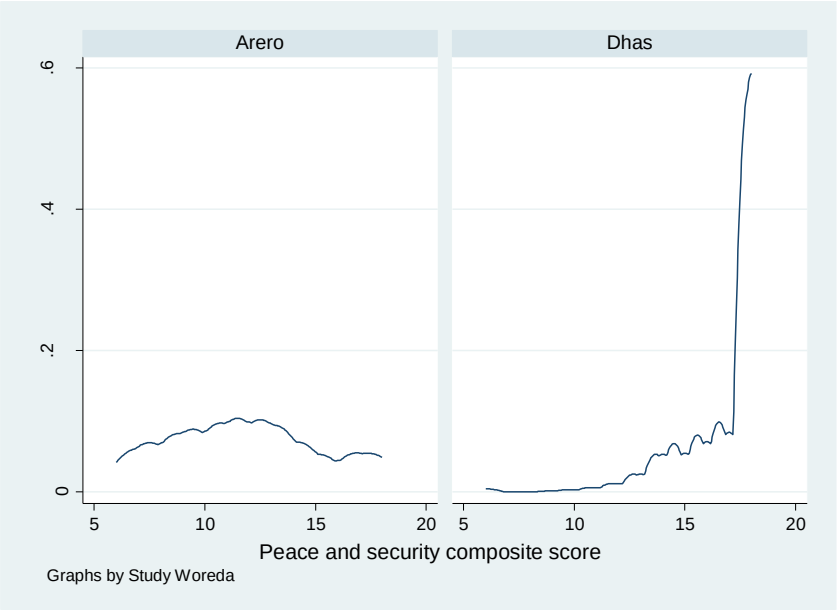


Figure 12. Kernel density distribution for peace and security scale composite index by district, 2016

3.4.6. Infrastructure

Main infrastructure found in Dhas and Arero districts of Borana zone comprises the health facilities(health centers and health posts), road, market, schools and water structures.The highest health facility found inthe four kebeles wasa health center, while the lowest one washealth post. Majority of the households had totravel for more than an hour to reach the nearest health facility, except for Wachillekebele (Table8).

Table 12. Percentage of households' travel time to reach the nearesthealth facility in the four Kebeles, Borana zone, 2016

Time (min)	Erdar	Wachille	Galaba	Gorille

<=30	20.3	44.1	21.2	14.4	X^2 = 261.906
31-60	4.1	50.0	29.7	16.2	df = 12
61-90	13.2	11.6	38.0	37.2	p-value = 0.000
91-120	27.8	24.1	11.1	37.0	
>120	29.7	6.3	20.4	43.6	

Market is a critical infrastructure among Borana pastoralists. Similar to the health facilities, majority of the households need to travel more than two hours to reach the local available market place. However, Wachile hadbetter access to the local market compared to the other study Kebeles (Table 13).

Table 13. Percentage of households' travel time to reach to the nearestmarket facility in the four Kebeles, Borana zone, 2016

Time (min)	Erdar	Wachille	Galaba	Gorille	X^2 Test
<=30	4.8	57.4	24.3	13.5	X^2 = 261.906
31-60	2.6	26.3	36.8	34.2	df = 12
61-90	7.4	11.1	44.4	37.0	p-value = 0.000
91-120	14.0	30.2	14.0	41.9	
>120	35.4	5.8	18.3	40.5	

In the four Kebeles, there wasno conventional treatment plant for water supply;the water sources werescattered at different places. The detail explanation are given under the Environment section.

Livestock related services among the study communities weresomewhatinadequate to the majority of households (Table 14)

Table 14. Adequacy of livestock related facilities in the two districts of Borana zone, 2016

Livestock related services		Arero		Dhas		Total	
		N	%	N	%	N	%
Access to pasture and other feeding	Inadequate	387	87.0	588	95.9	975	92.2
	Adequate	58	13.0	25	4.1	83	7.8
Access to drinking water for livestock	Inadequate	217	48.8	482	78.6	699	66.1
	Adequate	228	51.2	131	21.4	359	33.9
Appropriate grazing technique	Inadequate	413	92.8	577	94.1	990	93.6
	Adequate	32	7.2	36	5.9	68	6.4
Hayfield	Inadequate	389	87.4	591	96.4	980	92.6
	Adequate	56	12.6	22	3.6	78	7.4
Animal fodder or forage	Inadequate	402	90.3	594	96.9	996	94.1
	Adequate	43	9.7	19	3.1	62	5.9
Closure of livestock routes	Inadequate	431	96.9	495	80.8	926	87.5
	Adequate	14	3.1	118	19.2	132	12.5

Livestock related services		Arero		Dhas		Total	
		N	%	N	%	N	%
Mobility of livestock	Inadequate	266	59.8	427	69.7	693	65.5
	Adequate	179	40.2	186	30.3	365	34.5
Accessibility of livestock market	Inadequate	380	85.4	433	70.6	813	76.8
	Adequate	65	14.6	180	29.4	245	23.2
Level of veterinary services	Inadequate	351	78.9	468	76.3	819	77.4
	Adequate	94	21.1	145	23.7	239	22.6
Access to livestock mobility	Inadequate	389	87.4	458	74.7	847	80.1
	Adequate	56	12.6	155	25.3	211	19.9

Factor analyses were done onvarious aspects of infrastructure components. Reliable factor scores were summarized by three component values. The first, second and third unrotated factor scores have 36.6, 20.3 and 16.2 percent variability, respectively, while the rotated components have 25.6, 25.5 and 21.9 percent variability (table 15). Cronbach's alpha was 0.5 and the lowest communalities registered was 0.61. The first component mainly represents availability of animal feed and access to water, the second component is distance to market and health facility, and the third component is access to market and veterinary services. Due to its highest percent variability, the first unrotated component was used to represent the infrastructure dimension for further analyses.

Table 15. Loadings of the infrastructure variables to the different component values among rotated and unrotated factors.

	Unrotated			Rotated		
Selected Infrastructure variables	Comp1	Comp2	Comp3	Comp1	Comp2	Comp3
Appropriate grazing technique	0.60		-0.565	0.853		
Animal fodder or forage	0.611		-0.485	0.789		
Access to livestock water	0.749			0.614		0.4079
Health facility distance (negative)	0.608	-0.673			0.926	
Market distance (negative)	0.66	-0.609			0.917	
Accessibility of livestock market	0.354	0.534	0.565			0.847
Level of Vet services provided	0.558	0.452	0.415			0.798
% variance	**36.6**	**20.3**	**16.2**	**25.7**	**25.5**	**21.9**

3.4.7. Environment

In Ethiopia,as a yearly regular schedule, communities are undertaking a watershed management activities in their locality. However, no watershed management wasobserved in the study kebeles. There wasno organized solid and liquid waste management practice. Local practices of cow dung disposal mechanisms were observed. At village level, cow dung waspiled up to the extent of creating a local hummock. These disposal sites wereserving as a breeding media for flies and other vermin. The environment around the local market places wasseverely contaminated with plastic and other packaging materials.

Figure 13. Picture showing cow dung collected and piled up at a specific place

Though the environment is generally arid, some parts of the study area were covered with natural forests where different wildanimalswereinhabiting. However, we learnt that, due to water scarcity, those animals startedmigrating to other places and they were endangered during mobility. As a result of over grazing and absence of water, most of the grazing fieldswere dry and dusty.

Water sources werevery limited,yieldinginsufficient output. Water sources werelocated at various distance and take different travel times from each household. Onaverage, a household member had to travel for about 75 minutes to reach the available water source.

Table 16. Travel time to reach the nearest water source in the study Kebeles of Borana zone, 2016

Time to reach water source (min)	Erdar		Wachille		Galaba		Gorille		Total	
	N	%	N	%	N	%	N	%	N	%
<=15	47	17.7	122	46.0	19	7.2	77	29.1	265	100
16-30	28	16.9	29	17.5	48	28.9	61	36.7	166	100
31-60	34	15.8	24	11.2	77	35.8	80	37.2	215	100
61-90	18	32.7	6	10.9	18	32.7	13	23.6	55	100
91-120	61	35.1	12	6.9	33	19.0	68	39.1	174	100
>120	64	35.0	11	6.0	46	25.1	62	33.9	183	100
Total	252	23.8	204	19.3	241	22.8	361	34.1	1058	100

Most households (91%) had second alternative water source, while some (26%) a third water source. In the study communities, only few households weregetting water from protected sources (protected wells and protected springs) which werevery limited in number (Table 17).

Table 17. Type and magnitude of water sources in the study area of Borana zone.

Water source type	1st Source		2nd Source		3rd Source	
	N	%	N	%	N	%
Ela	298	28.2	481	45.5	53	5
Open water bodies (mainly ponds)	224	21.2	251	23.7	144	13.6
Piped water to house or yard	3	0.3	1	0.1	1	0.1
Protected spring	5	0.5	9	0.9	3	0.3
Protected well	81	7.7	49	4.6	23	2.2
Public tap or standpipe	281	26.6	73	6.9	30	2.8
Wadi (Maansa) –water from sand	163	15.4	81	7.7	9	0.9
Water vendor	3	0.3	3	0.3		
Rainwater tank			1	0.1	1	0.1
Unprotected spring					1	0.1
Unprotected well					9	0.9
No secondary/tertiary source			109	10.3	784	74.1
Total	**1058**	**100**	**1058**	**100**	**1058**	**100**

Figure 14. Ela, a traditional water source in the Borana pastoralist communities, 2016

Most households weregetting water from ela. Ela, which has unique feature (Figure 13) and the most popular water source in the Borana pastoralist communities, accounted for 28.2% and 45.5% as first source and second source, respectively.

Most (91%) of the households in Arero and Dhas wereconsuming water less than 20 liters per capita per day. The distribution of per capita water consumption is explained in figure 14.

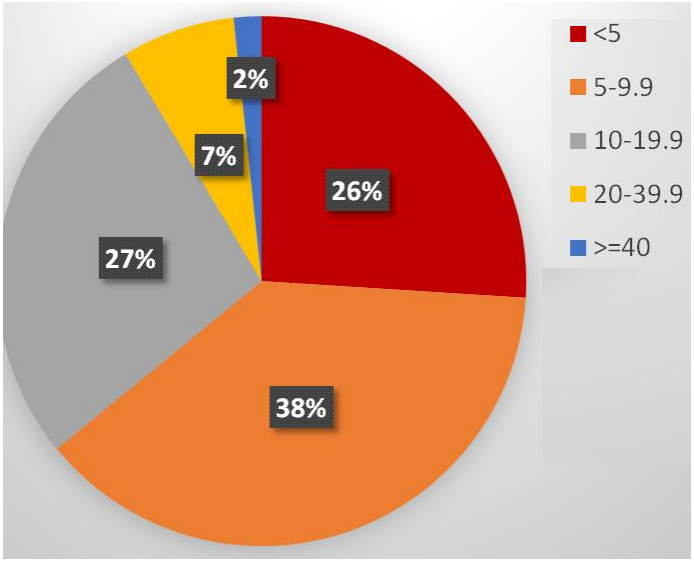


Figure 15. Per capita water consumption per day in the study communities of Borana zone, 2016

The component analyses of environmental variables revealed that water source protection, number of water sources per household, and water source distance were the best variables representing the Environment dimension. The dimension is represented by two components

where the first and second components are represented by 46.3 and 31.7 percent variability, respectively. The rotated components arerepresented respectively by 41.3 and 36.7 percent variance. The first component in general deals withwater source characteristics and the second one is about availability of rain water (Table 18). The first unrotated component was used to represent the dimension.

Table 18. Loadings of the environmental variables to the different component among rotated and unrotated factors.

Selected variables	Unrotated		Rotated	
	Comp 1	Comp 2	Comp 1	Comp 2
Water source protection	0.793		0.865	
Water source distance	0.58	-0.537	0.785	
Number of water sources	0.863		0.501	0.779
Availability of rain water source		0.85		0.91
% variance	46.3	31.7	41.3	36.7

3.4.8. Human capital

About 71% of the communities in Dhas and Arero were unable to read or write. Majority (72.8%) of the children younger than 10 years were not attending schools. Forall age groups, the percentage of illiterates wasvery high (>77%) except for the age group 10-19. Forthis age group, more than 40% of the community memberswereliterate (Table 19).

Table 19. Educational status by age group of the study communities in Borana zone, 2016

Age group	Illiterate	Read and write	primary, 1-8	secondary,9-10	preparatory,11-12	Certificate	diploma	degree and above	Total
5-9	72.8	3.4	23.7	0.1	0.0	0.0	0.0	0.0	100
10-14	52.8	5.0	41.6	0.3	0.1	0.0	0.1	0.1	100
15-19	56.3	5.9	31.2	4.6	1.0	0.7	0.3	0.0	100
20-24	66.8	4.4	18.1	6.7	1.4	1.6	0.5	0.5	100
25-29	75.5	2.3	15.8	4.3	0.8	0.5	1.0	0.0	100
30-34	81.8	3.2	11.4	1.4	0.7	0.0	1.4	0.0	100

Age group	Illiterate	Read and write	primary, 1-8	secondary,9-10	preparatory,11-12	Certificate	diploma	degree and above	Total
35-39	82.7	2.6	14.3	0.0	0.5	0.0	0.0	0.0	100
40-44	84.4	3.1	11.5	0.0	0.5	0.0	0.5	0.0	100
45-49	92.2	2.0	3.9	0.0	1.0	0.0	1.0	0.0	100
50-54	90.7	0.0	7.9	0.7	0.0	0.0	0.0	0.7	100
55-59	93.4	3.3	3.3	0.0	0.0	0.0	0.0	0.0	100
60-64	94.9	2.2	1.4	1.4	0.0	0.0	0.0	0.0	100
>=65	98.7	0.0	1.3	0.0	0.0	0.0	0.0	0.0	100
Total	71.0	3.6	22.6	1.7	0.4	0.3	0.3	0.1	100

Forall age groups, except for age group 15-19, majority of the female population wereilliterate. However females in the age group 15-19, more than 50% of the population wereliterate. For the male population (Table20?), more than 50% of children in the age group of 5-9 werein primary school.

Table 20. Percentage of educational attainment for male and females in Borana pastoralist communities

	Male								Female							
Age	Illiterate	Read and write	primary, 1-8	secondary,9-10	preparatory,11-12	certificate	diploma	degree and above	Illiterate	Read and write	primary, 1-8	secondary,9-10	preparatory,11-12	certificate	diploma	degree and above
5-9	47.6	4.9	47.6	0.0	0.0	0.0	0.0	0.0	98.7	0.0	1.3	0.0	0.0	0.0	0.0	0.0
10-14	57.1	3.2	39.2	0.4	0.0	0.0	0.0	0.0	70.0	4.7	25.2	0.2	0.0	0.0	0.0	0.0
15-19	52.1	6.4	36.1	3.5	1.6	0.3	0.0	0.0	48.5	6.8	43.9	0.2	0.2	0.0	0.2	0.2
20-24	53.8	7.2	23.3	10.3	2.2	1.3	0.9	0.9	60.8	5.5	25.9	5.8	0.3	1.0	0.7	0.0
25-29	59.2	3.8	25.0	8.2	1.6	0.5	1.6	0.0	80.8	1.4	12.5	2.9	0.5	1.9	0.0	0.0
30-34	69.6	5.7	19.0	1.9	1.3	0.0	2.5	0.0	89.4	0.9	7.9	0.9	0.0	0.5	0.5	0.0
35-39	69.6	2.9	26.5	0.0	1.0	0.0	0.0	0.0	97.5	0.0	1.6	0.8	0.0	0.0	0.0	0.0
40-44	77.9	4.8	16.3	0.0	1.0	0.0	0.0	0.0	96.8	2.1	1.1	0.0	0.0	0.0	0.0	0.0
45-49	85.7	4.8	7.1	0.0	0.0	0.0	2.4	0.0	92.0	1.1	5.7	0.0	0.0	0.0	1.1	0.0

Age	Male								Female							
	Illiterate	Read and write	primary, 1-8	secondary,9-10	preparatory,11-12	certificate	diploma	degree and above	Illiterate	Read and write	primary, 1-8	secondary,9-10	preparatory,11-12	certificate	diploma	degree and above
50-54	86.3	0.0	11.0	1.4	0.0	0.0	0.0	1.4	96.7	0.0	1.7	0.0	1.7	0.0	0.0	0.0
55-59	88.2	5.9	5.9	0.0	0.0	0.0	0.0	0.0	95.5	0.0	4.5	0.0	0.0	0.0	0.0	0.0
60-64	92.6	3.7	1.2	2.5	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>=65	98.7	0.0	1.3	0.0	0.0	0.0	0.0	0.0	98.2	0.0	1.8	0.0	0.0	0.0	0.0	0.0
Total	65.0	4.3	26.2	2.8	0.8	0.2	0.5	0.1	60.7	2.9	17.0	1.0	0.1	0.3	0.2	0.0

3.4.8.1. School Attendance in the study community

The study showsthat 37.6% of the children who should be attending primary school were doing so. On the contrary, only 3.0% of the secondary-school-age youths (13-18 years) were in school. In both cases, NAR was slightly higher among females than among males. On the other hand, overall the GAR was 217.8% for primary school and 340.0% for secondary school and atboth levels, GAR was slightly higher among females.

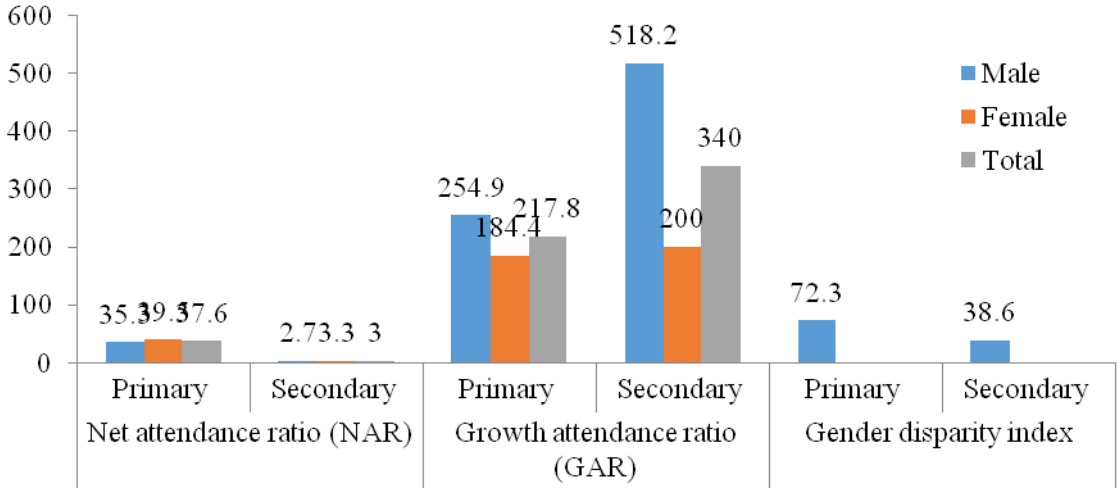


Figure 16. Net and gross school attendance of the school age population of the Dhas and Arero districts of Borana Zone, 2016

In the study community, the GPI was 0.723 (72.3%) for primary school attendance. However, it was 0.386 (38.6%) for secondary school attendance, indicating that the gender gap is smaller at the primary than the secondary level.

School dropout existed at different magnitude inthe different kebeles. The percentage of school dropout in Wachile and Galabakebeles (Arero District) was 30.3% and 37.9% while in Erdar and Gorille,it was 6.2% and25.6% respectively. In total, the number of students dropped schooling were445 and 613 respectively in Arero and Dhas districts.

The component analyses of the variables representing human capital gave two components which have 81.2% variability in which the first unrotated component represents 45.83% variance (Table 21). Slight difference of percent variability observed between the unrotated or rotated components. The first component representededucational status, while the second was about willingness to educate children.

Table 21. Rotated and unrotated component values of the selected human capital values

	Unrotated		Rotated	
	Comp1	Comp2	Comp1	Comp2
Educational status	0.901		0.944	
Level of formal education	0.901		0.944	
Willingness to send children to school		0.798		0.856
Willingness to educate all children		0.785		0.854
% variance	45.8	35.4	44.6	36.6

3.4.9. PsychosocialDistress

In study communities, about 16.2% of the respondents hadpsychosocial SRQ-F score greater or equal to seven, while the remaining have scored below seven. By sex, relatively males (20%) hadhigher psychosocial distress than the female population in which only 14% were under distress. The psychosocial distress among the male and female respondents significantly differed (p=0.012).

Table 22. Psychosocial distress by sex in the study communities of Borana zone, 2016

	Sex of the respondent	Total

		Female	Male		P-value
Psychosocial stress	yes	578	309	887	0.012
	No	94	77	171	
Total		672	386	1058	

The mean psychosocial distress score among the study population was 3.4 with standard deviation 3.8. Figure 17describes the distribution of the psychosocial distress score of the respondents. Majority of the respondents have scored zero.

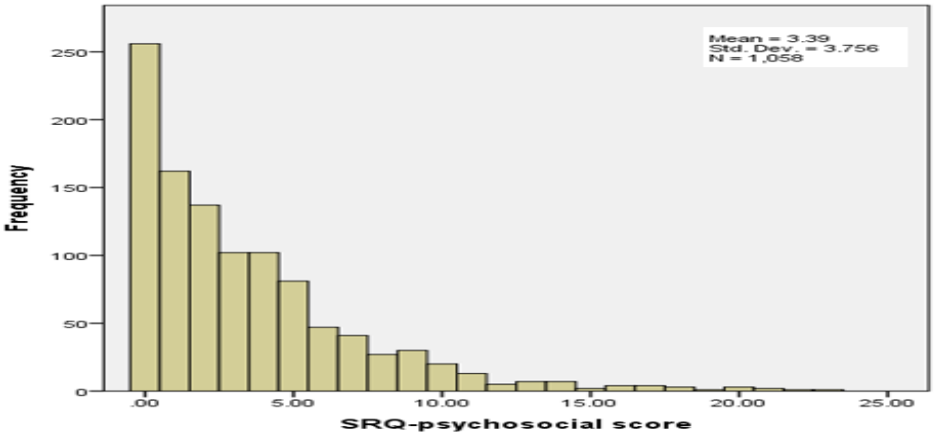


Figure 17. Frequency of the psychosocial score of respondents in Borana zone, 2016

In Arero district, 24.5% of the respondents experienced psychosocial distress while in Dhas, only 10.1% exhibited signs of distress.

After component analyses of the 29 psychosocial variables, three components representthe dimension with 54.3% variability while the first component represents27.5% variance. The three component values among the rotated and unrotated matrixes are explained in table22.

Table23. Loadings of the different variables along with the different rotated and unrotated psychosocial components.

	Unrotated			Rotated		
Selected variables	Comp. 1	Comp. 2	Comp. 3	Comp. 1	Comp. 2	Comp. 3
Feelingsof nervousness, tensionor worry	0.467	0.493		0.682		
Unhappiness	0.553	0.405		0.669		
Suffering indaily work	0.475	0.342		0.593		
Feeling that someone is jealous of him/her		0.409	0.303	0.542		

Selected variables	Unrotated			Rotated		
	Comp. 1	Comp. 2	Comp. 3	Comp. 1	Comp. 2	Comp. 3
Easily frightened	0.496	0.307		0.518		
Having headache often	0.579		-0.402		0.676	
Having sleep problem	0.623		-0.444		0.754	
Poor appetite	0.53		-0.558		0.794	
Feeling tired all the time	0.609	-0.518	0.452			0.899
Being easily tired	0.562	-0.577	0.447			0.911
% variance	27.5	14.5	12.3	19.0	18.4	17.0

3.5. Dimension trends between different groups

As it has been demonstrated by the radar graph, the different dimensions behave differently among groups. Between districts, human capital, and peace and security were better in Dhas; while infrastructure was better in Arero. Among the Kebeles, infrastructure and environment werebetter in Gorille; while in Galaba, food insecurity, and psychosocial distress were higher (Figure 17).

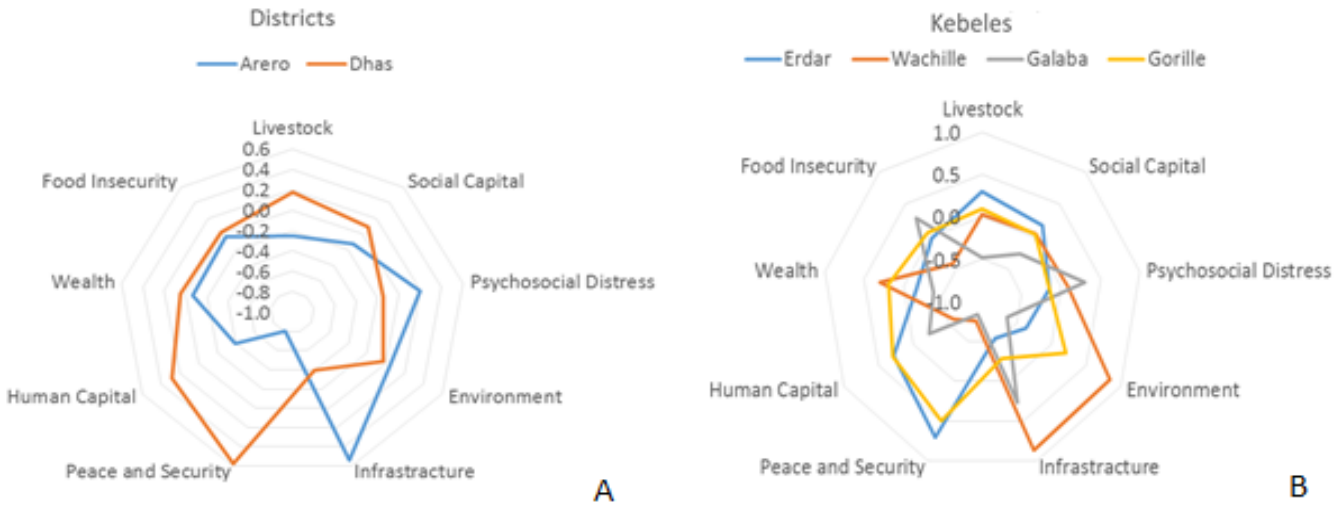


Figure 18. Spider graph showing the status of the dimensions in the twodistricts (A) and four Kebeles (B) of Borana zone, 2016.

Food insecurity, livestock and psychosocial distress werehigher among households with family size greater than five individuals. Environment was better in areas where there was nolivestock (0 livestock). Household with 1-9 livestocks showed higher psychosocial distress and higher

food insecurity. The condition of the other dimenions along with households with different family and livestock size are illustrated in Figure 18.

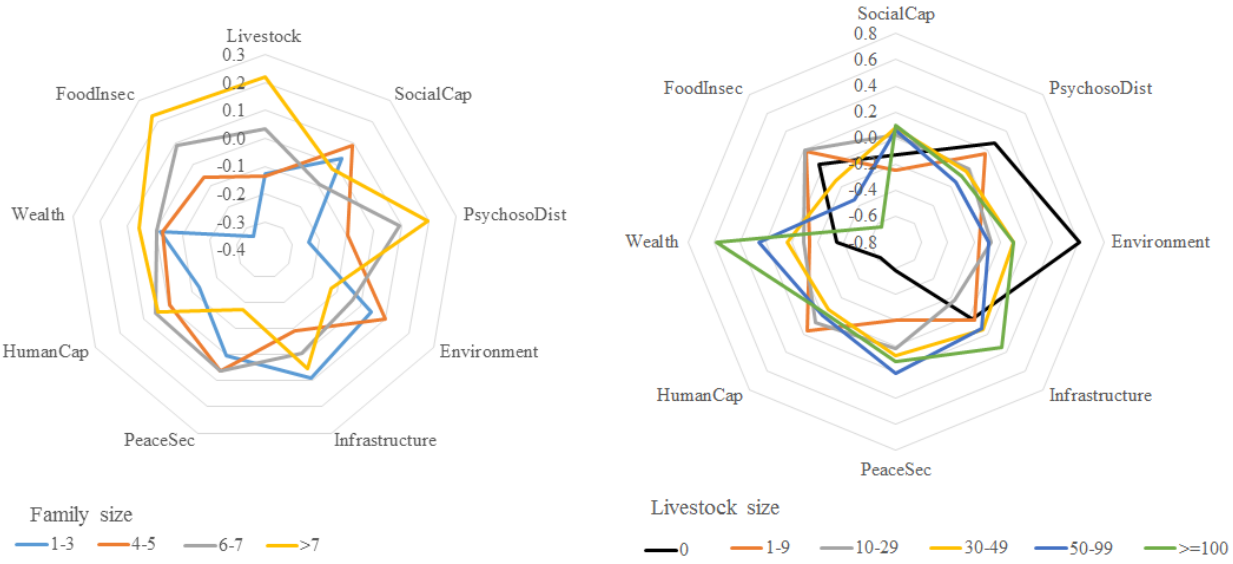


Figure 19. Magnitude of dimensions among households with different family (A) and livestock (B) sizes in Borana zone, 2016.

Households traveled for less than 15 minutes to a water point in the area where environment and infrastructure condition were better. Households who were consuming 5 L/cap/day had higher food insecurity and higher psychosocial distress. On the other side, households consuming 40 L/cap/day were better in wealth, environment and infrastructure (Figure 19).

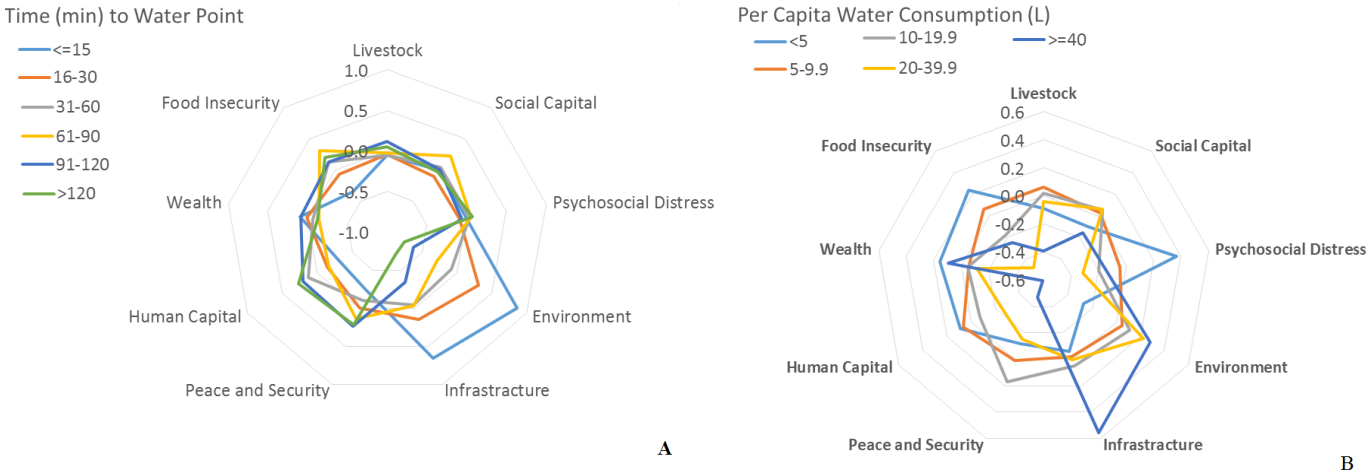


Figure 20. Condition of the dimensions among households with different travel times to a water point (A) and per capita consumption of water (B)

3.6. Prediction of the outcome dimension

3.6.1. Multiple regression model

Multiple linear regression revealed that environment is not a significant predictor of psychosocial distress at first level. At the second level, environment remained insignificant predictor but livestock, wealth and food insecurity become significant predictors. At the third level, only food insecurity, social capital, and peace and security become the significant descriptors. At the fourth level, human capital was added but didn't show significant prediction. The model coefficients and other details are explained in table 27. Community network, and peace and security were negatively predicted psychosocial social distress; better social network associated (higher score) with lower psychosocial distress (lower score), implying better social-network led to better psychosocial status in the community. Likewise, higher score on peace security scale associated to reduced score to psychosocial distress, suggesting that existence of peace and security contributed to improved psychosocial wellbeing in the community.

Table 24. Multiple linear regression model to predict psychosocial distress at different levels.

Predictors	Unstandardized Coefficients		Standardized Coefficients	T	P-value
	B	Std. Error	Beta		
(Constant)	-.293	.105		-2.795	.005
Sex	.129	.066	.062	1.956	.051
ERDER	.080	.083	.034	.966	.334
WACHELE	.220	.108	.087	2.033	.042
GALABA	.237	.112	.099	2.108	.035
Environment	.011	.036	.011	.295	.768
Livestock	-.048	.032	-.048	-1.497	.135
Infrastructure	-.062	.037	-.062	-1.677	.094
Wealth	.057	.031	.057	1.838	.066
Food insecurity	.145	.032	.145	4.539	.000
Social capital	-.107	.030	-.107	-3.563	.000
Peace and security	-.144	.041	-.144	-3.524	.000
Human capital	.055	.033	.055	1.659	.097

The second outcome variable, human capital, was stepwise predicted at different levels. Control variables are indicated at model zero. The predicting variables of human capital and their model characteristics are indicated at different model levels (Table 24).

Table 25. Multiple linear regression model to predict human capital at different levels. Highlighted variables with significant prediction

Predictor	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.809	.095		8.480	.000
Sex	-.425	.061	-.205	-7.006	.000
ERDER	-.079	.078	-.033	-1.013	.311
WACHELE	-.625	.100	-.247	-6.261	.000
GALABA	-.392	.105	-.165	-3.738	.000
Environment	-.087	.034	-.087	-2.558	.011
Livestock	.062	.030	.062	2.075	.038
Infrastructure	-.087	.034	-.087	-2.529	.012
Wealth	.046	.029	.046	1.560	.119
Food insecurity	.133	.030	.133	4.428	.000
Social capital	-.060	.028	-.060	-2.133	.033
Peace and security	.032	.039	.032	.839	.402
Psychosocial distress	.048	.029	.048	1.659	.097

3.6.2. Structural equation modelof the dimensions

Structural equation model (Figure 21) clearly describes the relationship between dimensions. Except between wealth and food insecurity, environment and social capital, environment and psychosocial distress, other dimensions showed significant (p-value>0.05) relationship to each other.

The outcome variables, human capital and psychosocial distress had significant relationship with social capital, and peace and security dimensions. The outcome dimensions significantly affect the food insecurity in the study communities.

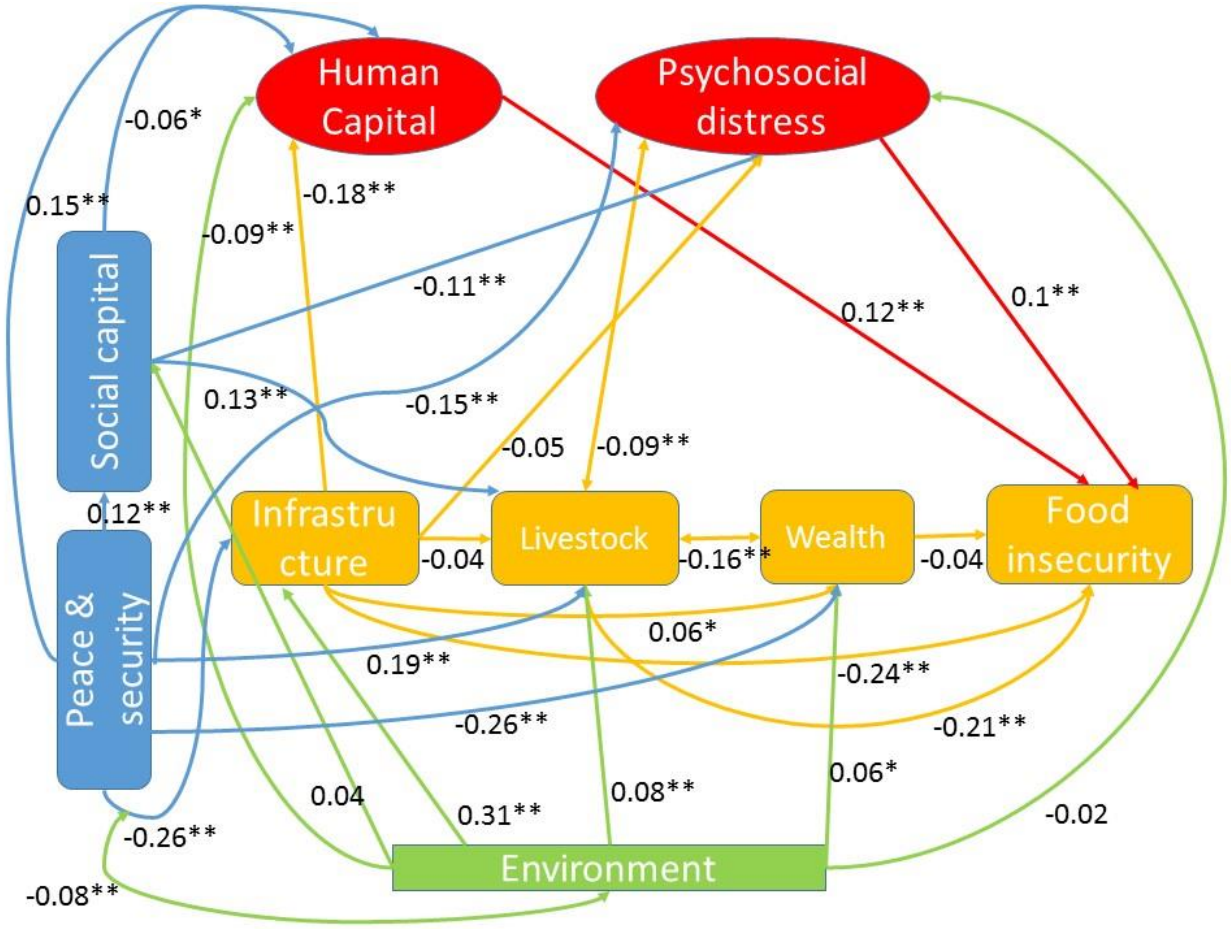


Figure 21. Structural equation model showing the relationship betweenthe different resilience dimensions in Borana zone. ** = p<0.01 and * = p<0.05.

3.6.3. Decision tree model

3.6.3.1. Human capital prediction for decision support

Improving human capital in the Borana Zone could help to increase the pastoralists'resilience to the effects of recurrent droughts as they might have a better chance of creating an alternative means of livelihood. The decision tree model suggests that peace and security is a vital dimension to tackle problems related to human capital. In addition, next to peace and security, improving food insecurity and infrastructure will help to further improve the human capital statusin the Borana pastoralist communities.

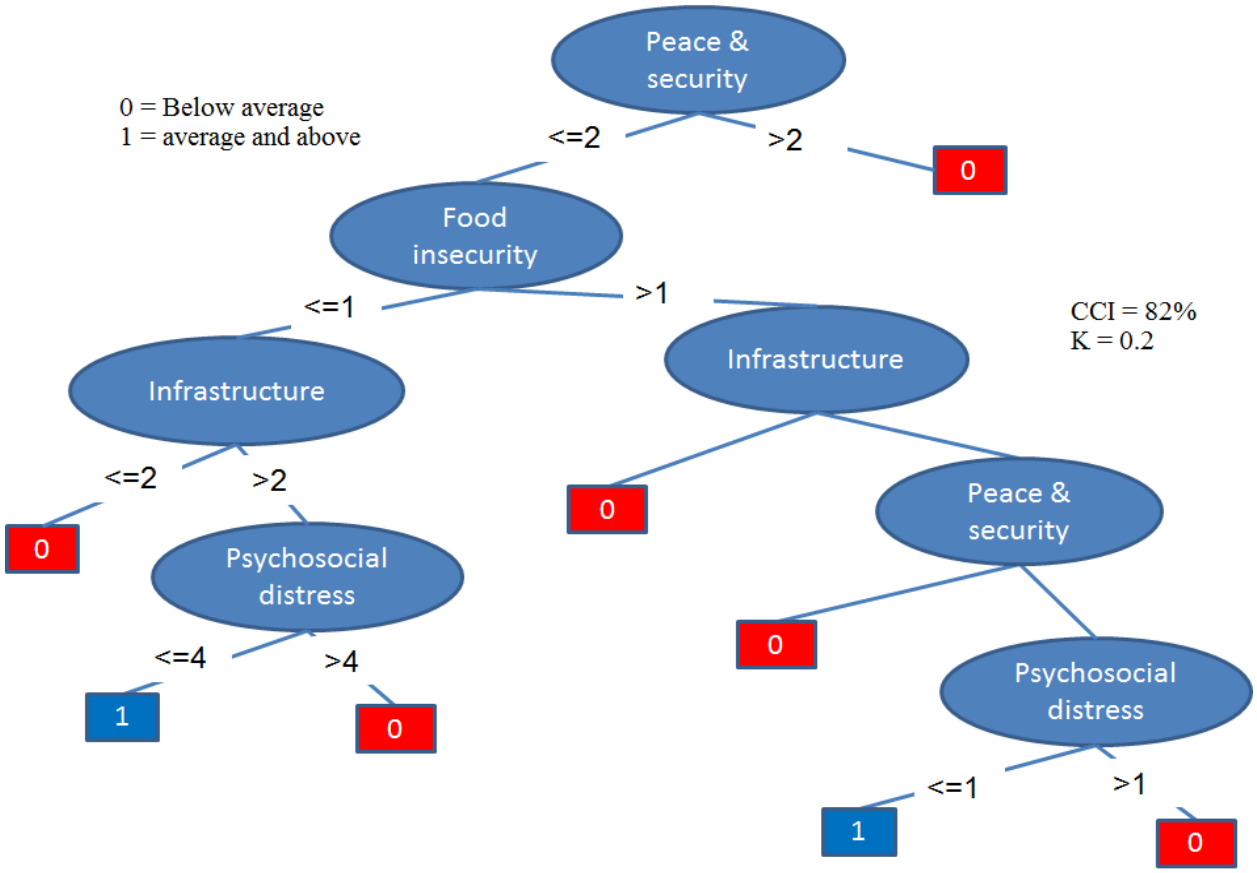


Figure 22. Decision tree model to predict human capital in the two districts of Borana zone, 2016

1.1.1. Psychosocial prediction for decision support

Decision tree model verifies that peace and security is a vital point of intervention on the reduction of psychosocial distress. Tackling food insecurity is another point of intervention where psychosocial distress could be reduced. Households with better environmental conditions, better human capital, and less livestock size are under distress. Figure 24, describes the focus dimension for psychosocial improvement.

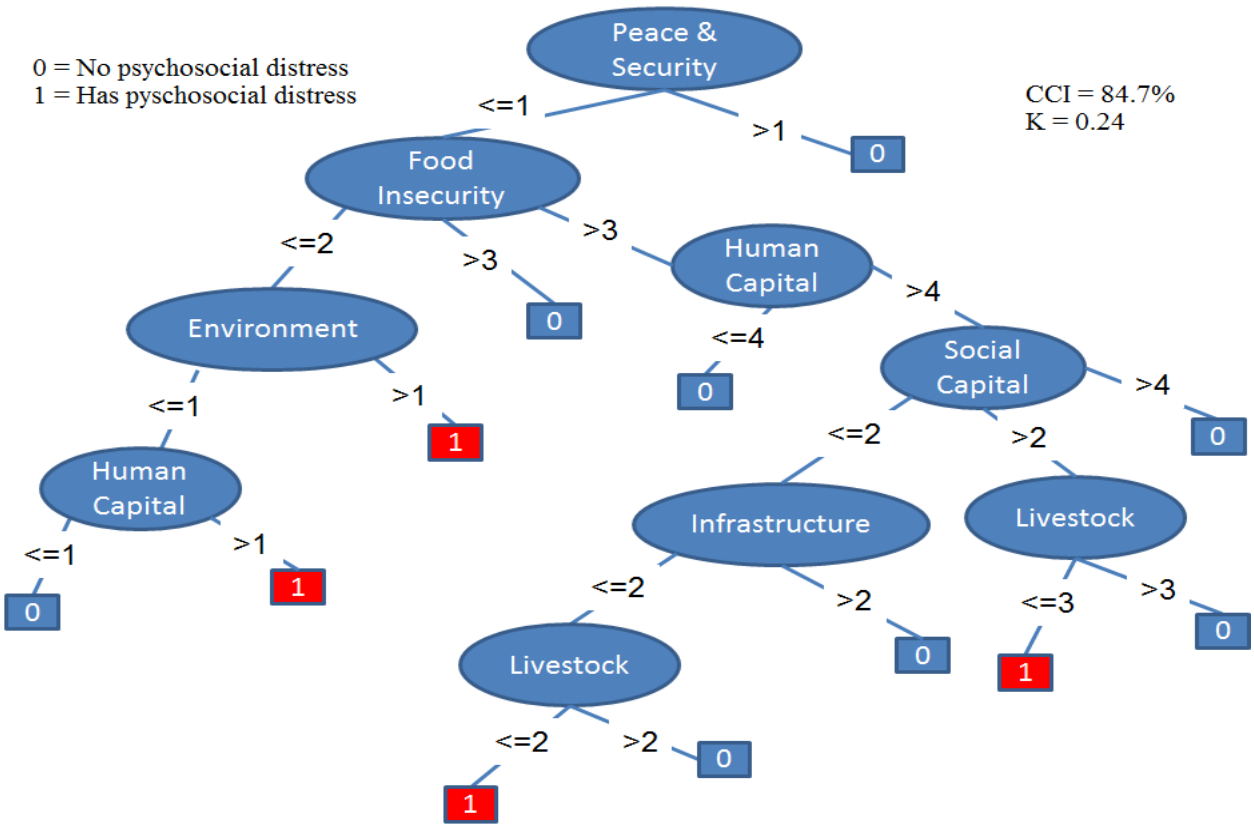


Figure 23. Decision tree model to predict human capital in the two districts of Borana zone, 2016

4. Discussion

The major driver of vulnerability in the Borana pastoralist communities is aridity of the environment (Abate, 2016) which is derived from regular precipitation and scarcity of water. This has been triggered by meagerenvironmental protection. Poor watershed management activities in the study area could worsen the problem in the future. The popular water sources available in the area, the elas, are access by both human and animal. As they are unprotected (Figure 14), the water sources could be contaminated with different contaminants which further pose varioushealth risks. Furthermore, as the environment is the basis for livestock raring and improvingwealth status of the pastoralists, environmental rehabilitation mechanisms need to be devised and implemented urgently. On the other side, due to the effects of drought, sense of food insecurity is very high among majority of the study communities.Food security is defined as a state in which "all people at all times have both physical and economic access to sufficient food to meet their dietary needs for productive and healthy life" (USAID, 1992). Food security exists "when all people, at all times, have physical and economic access to sufficient,

safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life" (FAO, 1996). In pastoralist communities, livestock is almost the sole source of livelihood including as source of food. Thus, given heavy dependence on livestock production, drought that affects livestock productivity at any level has an immense negative impact on household's food security. In the current study, the household food insecurity access scale (HFIAS) measure was applied to assess food security among households and the result indicated that large number of households were food insecure. Previous studies in Borana also indicated high level of seasonal food insecurity(Bekele, Ayana, Andre , & Anne, 2014) . Increased climate variability and drought recurrences have disproportionate impacts on household food security in the Borana pastoral system(Desta, Tezera, Gebru , & Kristjanson, 2011)(Doti, 2010) and which also reflected in the current study.

Food insecurity significantly affects psychosocial distress and human capital. Therefore, tackling food insecurity using various means could help to improve human capital and reduce the psychosocial distress in the area. Economic diversification could be one of the main means to improve food security.

Diversified economic activities, particularly involvement in both livestock and crop production, among household members are crucial for pastoralist resilience to any shocks and stress. However, the current study showed that more than three fourth (79.8%) of households' head were involved in livestock production as major means of livelihood or economic activities with extremely limited participation in agricultural crop farming. In fact there were small percentage of households that attempted to diversify or participate in non-livestock activities such as shop, trade and small scale income generating activities. Such practices should be strengthened or promoted on large scale, and further resilience building efforts could be built on community's own initiated strategies. This finding is clearly inconsistent with theearlier studywhich reported that majority of the Borana communities hadstarted practicing agricultural activities(Tache & Oba, 2010). This may indicate that due to increased frequency of recurrent droughts in the area, pastoralists might havelost motivation to participate in crop farming as there was a general beliefthat crops are more vulnerable to drought impact than livestock, as noted in the qualitative assessment(Zewdie , Argaw, & Negalign, 2015).

Availability of infrastructure, specifically access to water sources, pasture land and markets could excel the pastoralists' economic activities. Infrastructure is a vital resource for improving economic activities and maintain wealth sources, such as livestock (UN-HABITAT, 2011). Availability of infrastructure that enhances livestock productivity and environmental rehabilitation will transform pastoralists by creating different economic opportunities.

The current finding entails that any resilience interventions in pastoralist communitiesneed to expand participation in various forms of economic opportunities such as supporting income-generating activities (e.g. processing and selling of livestock products, gum productions, expansion of trade, and crop production) as a way to enhance households' socio-economic status. From the path model, it has been apparent that improving the human capital through tailored resilience interventions such as technical and vocational skills and business training could help to improve food insecurity. This in turn could facilitate access to microfinance services, saving and loan groups are appropriate to facilitate pastoralists' participation in diversified economic activities and economic empowerment of the target communities with special emphasison women and young people(MeryCorps)(Aklilu, Desalegn , Mesfin, & Negash , 2013).

Livestock production is the foundation of livelihood system in Borana with cattle being the most highly valued animals and an indication of social identity (Zewdie , Argaw, & Negalign, 2015). Livestock holding and diversity is an important resilience indicator in any pastoralist communities particularly among those who are vulnerable to recurrent shocksof drought. In the current study, nearly all (95.3%) of the studied households owned at least one type of livestock, with mean of 19.37. In terms of diversity, goat, milking cow and sheep were the dominant types of livestockownedby majority of the households in the area and other animals such as camel, donkey, mule and oxen were very limited in number. Some earlier studies also reported similar findings (Bekele, Ayana, Andre , & Anne, 2014). This indicatesthat their livestock was less diversified; particularly the proportions of drought resistantanimals, such as camels, were less common. Of course, diversification of herd composition among the study communitieslooks improvingcompared to some previous reports. Cattle are generally the most sensitive livestock typesto the adverse effects of climate change scenarios and they are with the highest

vulnerability to climate variability to be in arid environments (Lesnoff, Cornjaux , & Hiernaux, 2012) (Lunde & Lindtjorn, 2013) (Seo , McCarl, & Mendelsohn, 2010). Furthermore, less diversified livestocktypescould create the burden of overgrazing and make their management more problematic. But, by diversifying their livestock, pastoralists can generate a wider variety of livestock products and make better use of the available forage in different seasons, even in times of crisis. Having different livestock types,some with tolerance to drought, heat stress, or water and feed shortages, offer livestock keepers the possibility of choosing those livestock typesthat are better adapted to changing environmental conditions. Livestockdiversification also endows herders with different complementing utilities and rangeland resource uses in addition to buffering ability against risks. Therefore, livestock diversification is increasingly well accepted as key adaptation strategy to climatic changes and adverse environmental effects and this suggests that it is crucial to pay attention to betterlivestock diversification in the overall effort to improve livelihoods and resilience to climate change in a pastoral context.

Community network/social capital is a key asset of pastoralists.In thequalitative study, it was documented that the target communitieshad strong indigenous social support scheme which playedvital role in periods of stress and shocks, such as recurrent droughts. The current analysis provided three social support elements crucial to support pastoralists which related to routine social support for coping with and surviving crises;Busa Gonofa; and external influence. Busa Gonofa is clan based asset redistribution or restocking drought affected families. In this system, cattle are collected from those who can afford to contribute and then redistributed to the affected families and it supports a variety of positive adaptive and coping strategies,includingother resilience elements such as wealth, livestock as well as infrastructures and social services. Through thisindigenous asset redistribution mechanism, those communities wereable to regulate asset distribution, managed risks, and promoted collective actions for mutual safety. Unfortunately, this component of support has received lower score in the current study, indicating degradation of the scheme as also noted in the qualitative study. Some earlier studies also reported significant deterioration of this system [(Wasse)]. Thus, it is highly important to strengthen and revitalize the role of community networks, institutions and relationship as part of resilience building efforts with particular attention to Busa Gonofa. On the other hand, it is

important to take into considerations the influence of external aid and supports while designing interventions that promote community capital.

Evidence has shown that peace and security is vital to building resilience capacities and coping strategies in pastoralist communities particularly in drought affected pastoralists(Alinoyi , D'Errico, Mane, & Romano)(Catley & Iyasu, 2010)(MeryCorps). Consistent with past evidences, the current study revealsthat lack of peace and security was quite a big concern particularly in some of the study kebeles,such as Wachille and Geleba with statistically significant differences. Stability is vital for asset accumulation, and it is essential to promote or strengthen indigenous and customary systems of conflict management and resolution so that pastoralists are better able to negotiate on resources during drought events. The decision tree model clearly indicates that a sense of security among Borana communities will bring in the improvement of human capital and psychosocial distress.

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Annex: Survey tools

ResilientAfrica Network (RAN)
Horn of Africa Resilience Innovation Lab
Household Survey Questionnaire

Household ID Number: ____ ____ ____ ____
Got: _____ Kebele: _____ Woreda: _____

Date of interview (dd/mm/yyyy)|____|____|/|____|____|/|**_2_|_0_| _0_|_7 |** *(Ethiopian Calendar)*

Enumerator's Name _____ Enumerator's CODE: |____|____|
Checked by/_____

Factors affecting Resilience to Effects of Recurrent Droughts in the Borana Pastoralist Communities, Southern Ethiopia

Introduction: Good morning/afternoon. My name is _____. I have come from Jimma University to conduct a research sponsored by HoA RILab, RAN. Funded by USAID, this research aims at understanding factors that influence how the Borana pastoralist communities respond to the effects of recurrent droughts. I am here to request you to participate in this research. What we learn from this study will be used to design some intervention projects in order to prevent and tackle droughts as well as related problems that affect the Borana pastoralist communities.

Procedures/Risks/Compensation: I am here to kindly request your time to answer some questions about your own feelings and perspectives related to different aspects of resilience dimensions. We do not think there are any risks associated with participating in this study other than the possibility that some topics may make you feel slightly uncomfortable to talk about. However, you can refuse to answer certain questions if you are not comfortable, or decline to participate in the interview at all. The interview will take about _____hours/minutes. Your honest answers will help the researchers understand important issues that could benefit pastoralists in Borana Zone in particular and in Ethiopia in general. We are going to visit up to 1100 households in both Arero and Dhas districts for this activity.

Confidentiality: All of your responses will be kept confidential- and I will not collect any information that could connect your identity to the information you share.

Your thoughts and opinions are valuable, and I would be very thankful to have you participate in this interview.

Do you agree to participate in the study? 1. Yes 0. No

Contacts: If you have any questions or concerns at any time related to this study you may contact:
Prof Kifle Woldemichael, Director of HoA RILab, Jimma University.
Telephone: +251-935123168

Signature of enumerator: _____

Socio-demographic Characteristics

No.	Questions and filters	Coding category	Skip rule
SECTION 1: BACKGROUND CHRACTERSTICS OF THE RESPONDENT			
1.	Gender of the respondent	1 Female 2 Male	
2.	How old are you? *(in completed years)*	_____	
3.	What is the highest level of schooling you have completed?	Highest grade completed _____	
4.	What is the highest level of schooling you have completed?	0. No formal schooling 1 999. Read and write	
5.	What is your current marital status?	1 Single 2 Married 3 Widowed 4 Divorced	
6.	What is your religion?	1 Muslim 2 Orthodox Christian 3 Protestant 4 Catholic 5 Wakefeta 6 Others *(Specify)*_____ _____	
7.	What is the closest modern health facility to your house?	1 Health post 2 Health centre 3 Private clinic 4 Other (specify) _____	
8.	How long does it take for you to get to the health facility?	_____ minutes Don't know 999	
9.	How long does it take for you to get to the market?	_____ minutes Don't know 999	

WATER COLLECTION: "Now, I would like to ask you about the ways that your household collects water."		
10.	**Who does usually collect water for your household? (Do not read the options)** *(Only one answer is allowed!)*	1. Wife 2. Husband 3. Adult woman in household 4. Adult man in household 5. Girl child in household 6. Boy child in household 7. A person outside household 8. Other: _____
11.	**Who does usually assist the main water collector or equally collects water for your household?** *(Only one answer is allowed!)*	1. Wife 2. Husband 3. Adult woman in household 4. Adult man in household 5. Girl child in household 6. Boy child in household 7. A person outside household 8. Not assistant *9.* Other: _____
"Will you show me all the containers you use to collect water from outside the household?"		
12.	**What is the container that you are usually using to fetch water**	**1. Jerry Can** **2. Okele** **3. Other _____**
13.	**How many of each of these containers do you use to fetch water per day?**	*Calculate total capacity by adding together the size of each container (how many liters it carries) times the number of containers* Total capacity of water collection containers: [_____] liters
14.	**Will you show me any containers you use to STORE water at this household, which are DIFFERENT from the containers used to collect water?** *(do not include rainwater tank)*	Total capacity of storage containers: [_____] liters *(do not include collection containers counted in question 11)* *9999 = No other containers to store water*
15.	**Does this household have a functional rainwater collection tank?**	0. No → SKIP to 15 1. Yes
16.	**If yes,**	2. Private (attached to a household or in private plot) 3. Communal pond
17.	*If private,OBSERVE: What is the capacity of this tank?*	[_____] liters

ENUMERATOR: Write the code for each source (from the community map) and go back to answer the questions for each one. (Community Mapping will be undertaken locating water sources with their types).

WATER SOURCE INVENTORY

"Now can you please tell me about ALL the different sources you have used for ANY PURPOSE in the past 12 MONTHS. Let's start with the main one you use…"								
		Source 1	**Source 2**	**Source 3**	**Source 4**	**Source 5**	**Source 6**	**Source 7**
18.	**What type of source is this?** 1. Open water bodies (river, lake, pond, dam, stream, irrigation canal, drainage ditch, etc) 2. Eela (unprotected) 3. Unprotected well 4. Unprotected spring 5. Protected well 6. Protected spring 7. Rainwater tank 8. Piped water to house or yard 9. Public tap/standpipe 10. Water vendor/ Sold from cart 96. Other *(describe)*	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]
19.	**How much time does it take you to travel to this source, one-way, to get water?** **(Write in minutes! 1 hour = 60 minutes)**	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes
20.	**How long do you usually have to wait at this source before you can get water?** **(Write in minutes! 1 hour = 60 minutes)**	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes	[_____] minutes
21.	**Do you usually use this source during the rainy season, dry season, or both?** **1. Rainy** **2. Dry** **3. Both**	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]
22.	**Are there ever times that you want to use this source but it is not functioning?** 0. **No** 1. **Yes**	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]
23.	**For how many months**	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]

	out of the year is this source NOT functional?	months	months	months	months	months	months	months
24.	**Do you ever use this source for DRINKING and/or COOKING?** 0. **No** 1. **Yes**	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]
25.	**For how many months out of the year do you rely on this source for your DRINKING and/or COOKING water?**	[_____] months	[_____] months	[_____] months	[_____] months	[_____] months	[_____] months	[_____] months
26.	**Do you have to pay for this source?** 0. No 1. Yes	[_____] If 0. No → KIP to 27	[_____] If 0. No → SKIP to 27	[_____] If 0. No → SKIP to 27	[_____] If 0. No → SKIP to 27	[_____] If 0. No → SKIP to 27	[_____] If 0. No → SKIP to 27	[_____] If 0. No → SKIP to 27
27.	***If yes*, How much do you have to pay?**	[_____] birr *Circle whether it is per:* Jerrycan / liter / week / month / year /	[_____] birr *Circle whether it is per:* Jerrycan / liter / week / month / year /	[_____] birr *Circle whether it is per:* Jerrycan / liter / week / month / year /	[_____] birr *Circle whether it is per:* Jerrycan / liter / week / month / year /	[_____] birr *Circle whether it is per:* Jerrycan / liter / week / month / year /	[_____] birr *Circle whether it is per:* Jerrycan / liter / week / month / year /	[_____] birr *Circle whether it is per:* Jerrycan / liter / week / month / year /
28.	**Do you ever treat this water to make it safe for drinking?** 0. No 1. Yes	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]
29.	**If yes, what is the mechanism** 1. **Boiling** 2. **Chlorination** 3. **Solar** 4. **Other (mention)** 5. **Not applicable**	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]

Psychosocial status

30. Psychosocial check list. Please write 1 for 'Yes' or 0 for 'No'

	Questions	Alternatives	
		Yes=	No=

		1	0
30.1.	Do you often have headache?		
30.2.	Is your appetite poor?		
30.3.	Do you sleep badly?		
30.4.	Are you easily frightened?		
30.5.	Do your hands shake?		
30.6.	Do you feel nervous, tense or worried?		
30.7.	Is your digestion poor?		
30.8.	Do you have trouble in thinking clearly?		
30.9.	Do you feel unhappy?		
30.10	Do you often cry?		
30.11	Do you find it difficult to make decisions?		
30.12	Is your daily work suffering?		
30.13	Are you unable to play a useful part in life?		
30.14	Have you lost interest in things?		
30.15	Do you feel you are a worthless person?		
30.16	Have you ever thought about committing suicide?		
30.17	Do you feel that tired all the time?		
30.18	Do you have uncomfortable feelings in your stomach?		
30.19	Are you easily tired?		
30.20	Do you feel that somebody has been trying to harm you in some way?		
30.21	Have you noticed any interference or anything else unusual with your thinking?		
30.22	Do you ever easily hear voice without knowing where they come from, and that other people cannot hear?		
30.23	Do you easily get angry at other people?		
30.24	Do you feel that someone has insulted or humiliated you?		
30.25	Do you feel that someone has cursed you?		
30.26	Do you feel that someone is jealous of you?		
30.27	Do you feel crawling sensations in under your skin?		
30.28	Do you feel burning sensation in your scalp or all over the body?		
30.29	Do you often feel your heart is beating too fast?		
30.30	Was any family member attempted suicide but not died in the past 12 months?		
30.31	Was there any family member died due to suicide in the past 12 months?		

Household Asset Development and facilities

31. Does your household have the following items?			
S/N	**Household asset**	**Response**	
31.1.	Electricity?	1. Yes	0. No
31.2.	Watch/clock?	1. Yes	0. No
31.3.	Radio/tape	1. Yes	0. No
31.4.	Television	1. Yes	0. No
31.5.	Mobile telephone	1. Yes	0. No
31.6.	Non-mobile telephone	1. Yes	0. No
31.7.	Refrigerator	1. Yes	0. No
31.8.	Table	1. Yes	0. No
31.9.	Chair	1. Yes	0. No
31.10	Bed with cotton/sponge/spring mattress	1. Yes	0. No
31.11	Electric mitad	1. Yes	0. No
31.12	Kerosene lamp/pressure lamp	1. Yes	0. No

31.13	Bicycle	1. Yes	0. No
31.14	Motorcycle	1. Yes	0. No
31.15	Animal-drawn cart	1. Yes	0. No
31.16	Car	1. Yes	0. No
31.17	Water supply	1. Yes	0. No
31.18	Toilet	1. Yes	0. No
31.19	kitchen	1. Yes	0. No
31.20	gas/electric stove	1. Yes	0. No
31.21	sewing machine	1. Yes	0. No
31.22	House in town	1. Yes	0. No
31.23	Livestock	1. Yes	0. No
31.24	Blanket/Gabi	1. Yes	0. No
31.25	Water storage pit	1. Yes	0. No
31.26	Jewels (Gold and silver)	1. Yes	0. No
31.27	Axe	1. Yes	0. No
31.28	Machete (Gejera)	1. Yes	0. No
31.29	Pasture land	1. Yes	0. No
31.30	Hayfield	1. Yes	0. No
31.31	Crop field /agricultural land	1. Yes	0. No
31.32	Forage	1. Yes	0. No
31.33	Beehives	1. Yes	0. No
31.34	Chickens	1. Yes	0. No
31.35	Sickle (Machid)	1. Yes	0. No
31.36	Riffle/Gun	1. Yes	0. No
31.37		1. Yes	0. No
31.38		1. Yes	0. No

Housing and latrine condition

32. Do you have a latrine? 1. Yes 0. No → skip to 35
33. If yes, type of the latrine
    0. Pit latrine without slab
    1. Pit latrine with slab
    2. Ventlated improved pit latrine
    3. Communal pit latrine (latrine used by more than one household)
    4. Other (specify)_____
34. What is the roof of the main house made from
    0. Thatched roof
    1. Corrugated iron sheet
    2. Mud and wood
    3. Plastic with grass or wood materials
    4. Other (specify)_____
35. What is the wall of the house made from
    0. Earthen material/mud
    1. Wood and mud
    2. Wood and grass
    3. Stone and mud
    4. Stone and concrete
    5. Concrete block/brick
    6. Other (specify)_____

36. What is the floor of the house
    0. Earthen material
    1. Concrete
    2. Other (specify)_____

Household livelihood strategy diversifications

We would like to learn about all members of this household and in what economic activities they are participating. This includes those who are members of the household who are away today but who live here most of the time. Could you please answer the following questions, starting with yourself and then moving from the oldest to the youngest household member?

37. Family Roaster (all usual household members): Livelihood strategies; all activities household members engaged in during the past one month

HH ID	Name	Relation to head of household*	Age in years	Sex 1.Male 2.Female	Education ** (if age ≥5years	Main economic5 years and above*	2nd major economic activities*

*Relationship to HHHs	**Educational status	***Economic statusfor five years and above)
1. head of household	Write higher grade completed (for formal education: example:- if a person is attending or terminated in grade 7, the status is 6)	1. Livestock production
2. Spouse	0. Illiterate	2. No job
3. Son/daughter	999. Read and write for non-formal education	
4. Father	1000. Not applicable	3. Small business
5. Mother		4. Shop/market/trader
6.		5. Herder
7. Grand mother		6. Student and in school
8. Grand mother		7. Causal work/daily labourer
9. Brother		8. Gum production
10. Sister		9. Charcoal/fuel wood production
11. Mother in law		10. Away from home/abroad

12. Father in law		11. Crop farming
13. Sister in law		12. Poultry production
14. Brother in law		13. Bee production
15. Other relative		14. GO/NGO emplyee
16. Other non-relative		15. NGO employee
17.		16. Others (specify)
18.		1000. Not applicable
19.		0. No other economic activity (for 2nd major economic activity)

Household source of incomes: Cash incomes

38. Could you please indicate the approximate value of cash income that your household has received from different sources during the last four weeks _____ birr

38.1. Selling Livestock and livestock products _____ birr

38.2. Selling cereal and other crops _____birr

38.3. Others sources (remittance, services, rents, etc) _____birr

39. Non-cash-Income Generating Activities

39.1. Do you have farming land? 1. Yes 0. No

39.2. Has your household cultivated any crop in the last season? This could be cereals, fruits, vegetables 1. Yes 0. No

39.3. If yes to Q42.2, fill the following table

	Crop type	Amount in quintals	Estimated price per unit
39.4.	Maize		
39.5.	Beans (Boloke)		
39.6.	Sorghum		
39.7.	Teff		
39.8.	Wheat		
39.9.			

39.10.	Did any of your household members work on other people's farms in exchange for food during the past six month?	1. Yes 0. No
39.11.	Did any of your household members work as herder for other people in exchange for food/cattle during the past six month?	1. Yes 0. No
39.12.	Did any of your household members work as herder for other people to earn money, during the past six month?	1. Yes 0. No
39.13.	Did you get any food out of hunting/fishing?	1. Yes 0. No
39.14.	Did you get any food out of other activities (fruit trees, gardening)?	1. Yes 0. No
39.15.	Did you get any goods (incl. foodstuff) by exchanging them for other goods (bartering)?	1. Yes 0. No
39.16.	Which goods did you give and which goods did you receive?	
39.17.	Did you receive any food aid in the last two years?	1. Yes 0. No

40. Does any member of this household have a microfinance saving and loan account?
    1. Yes 0. NO

40.1. How many people have saving account in your household? _____

41. Does any member of this household have village level saving and loan account?
    1. Yes 0. NO

41.1. How many people have this saving account in your household? _____

42. Does any member of this household have bank account?
    1. Yes 0. NO

42.1. How many people have this saving account in your household? _____

43. Over the past 12 months, did you or anyone else in this household borrow someone outside the household cash or in kind for business purpose?
    1. Yes 0. No

43.1. If yes to Q45, from whom did you or your family members borrow? (multiple answer is possible, but do not read the alternatives)

1. relative 2. neighbour 3. local merchant 4. money lender (katapila) 5. employer 6. edir 7. equb	8. religious institution 9. microfinance institutions 10. bank 11. NGO 12. other (specify)_____

44. Do you have plot of land 1. Yes 0. No

44.1. What is the amount of land in hectar? _____ha

44.2. What amount of this land is used for crop production? _____ha

44.3. What amount of this land is used for pasture? _____ha

Household food security

45. *Many households have times when it is difficult to get enough food. I am going to ask you a few questions about food in your household.* Rarely= once or twice in the past 4 weeks / Sometimes= 3-10 times in the past 4 weeks / Often= more than 10 times in the past 4 weeks

S/N	Question	Response Options	CODE
1	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	….|___|
1.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	….|___|
2.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1 = Yes	….|___|
3.a	How often did this happen?	1 = Rarely 2 = Sometimes	….|___|

		3 = Often	
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 = No (skip to Q5) 1 = Yes	….|___|
4.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q6) 1 = Yes	….|___|
5.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|
6.	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q7) 1 = Yes	….|___|
6.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q8) 1 = Yes	….|___|
7.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q9) 1 = Yes	….|___|
8.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (questionnaire is finished) 1 = Yes	….|___|
9.a	How often did this happen?	1 = Rarely 2 = Sometimes 3 = Often	….|___|

Community network scale

46. I would like to ask you about the networks and social supports which people may get in this community, particularly at the times of problem such as drought shock and stress. As I read the following statements please tell me the extent of your agreement or disagreement.

S/N	Statement	Yes/ Agree	Uncertain/ not sure	No/dis agree

46.1.	People can depend on each other in this community.	2	1	0
46.2.	Community members do not feel comfortable asking for assistance in this community.	2	1	0
46.3.	Community members are willing to help each other at the time of crises (e.g. during drought season)	2	1	0
46.4.	Better families are willing to loan milking cows to drought affected families	2	1	0
46.5.	In this community, better families are willing to share milk and milk products with drought affected families	2	1	0
46.6.	In this community, people are willing to share food or any items at the time of drought	2	1	0
46.7.	In this community, drought affected families would get good support from community members	2	1	0
46.8.	In this community, families who lost their livestock due to drought are restocked by community members.	2	1	0
46.9.	If something unfortunate happened to someone in this community, such as a serious illness, loss of livestock, or the death of a parent people in the community would get together to help them.	2	1	0
46.10.	Over the last five years the level of support in this community has gotten better	2	1	0
46.11.	Most people in this community are willing to help if you need it.	2	1	0
46.12.	If someone suddenly needed a small amount of money many people could be willing to provide this money?	2	1	0
46.13.	If you suddenly faced a long-term emergency such as drought crisis people will be willing to assist you	2	1	0
46.14.	If my neighbor or faces problem such as lost his/her livestock and assets, I will provide them with any support they need	2	1	0
46.15.	Busa Gonofa is important source of social support in this community for drought affected families	2	1	0
46.16.	Compared to five years ago, the support provided by busa gonofa has been decreased	2	1	0
46.17.	Busa Gonofa has been weakened these days	2	1	0
46.18.	People willing to contribute for Busa Gonofa has decreased	2	1	0
46.19.	People willingness to join Busa has been increased over the past five years	2	1	0
46.20.	External aid degraded the culture of social support in this community	2	1	0
46.21.	Modern governance structures negatively affected the cultural of social support system	2	1	0
46.22.	Gada system is an important source of support for affected families	2	1	0
46.23.	Gada system has weakened these days compared to the past five years.	2	1	0
46.24.	Members of this community help each other during shock and stress	2	1	0
46.25.	Members of this community are willing to share resource needed for livestock at the time of severe drought	2	1	0

Livestock size and diversifications

47. Does this household own any livestock and/or poultry?

1. Yes 0. No

48. If yes to, how many of the following animals does this household own?

	Livestock/ Poultry	Current Owning?			Owning before 5 years
		Total	# local breed	# hybrid	Total
48.1.	Oxen				
48.2.	Milking cow				
48.3.	Calf				
48.4.	Other cattle (bull, heifer)				
48.5.	Goat				
48.6.	Sheep				
48.7.	Camel				
48.8.	Mule				
48.9.	Donkeys				
48.10.	Horse				
48.11.	Laying hens				
48.12.	Non-laying hens				
48.13.	Chickens				
48.14.	Pullet				
48.15.	Beehives				

49. Livestock problems

	Thinking of the last one year, please rate the following according to your own opinion	Adequate	Poor	Very poor	Nill
49.1.	Access to pasture and other feeding				
49.2.	Access to drinking water for livestock				
49.3.	Appropriate grazing technique				
49.4.	Drinking water for livestock				
49.5.	Hayfield				
49.6.	Animal fodder or forage				
49.7.	Closure of livestock routes				
49.8.	Mobility of livestock				
49.9.	Accessibility of livestock markets				
49.10.	Level of veterinary services provided in this community				
49.11.	mobility				

50. Attitude towards livelihood diversification

S/N	Items	Agree	Uncertain	Disagree
50.1.	I want to continue rearing livestock			
50.2.	Pastoralist way of life is best for me and my family			
50.3.	I do have a plan to participate in non-livestock economic activities			
50.4.	I intend to participate in agricultural crop farming activities			
50.5.	I intend to participate in business activities such as shop, trade			
50.6.	I want to increase my herd size			
50.7.	I intend to send my children to school			

50.8.	All children should attend school			
50.9.	I intend to sell my cattle to save cash money in a bank			
50.10.	It would be better to sell cattle and have cash			
50.11.	I save regularly for long term financial goals such as educating children; food purchase or during problem like shortage of food			
50.12.	I intend to increase my savings by selling my livestock			
50.13.	I want to start business activities (eg. trade, shop, small business) by selling my livestock			
50.14.	I already have a saving account			
50.15.	If I would get credit and loan I will participate in non-livestock business activities			
50.16.	Limited financial and credit service is the main obstacle in this community to engage in income generating activities			
50.17.	In this area people don't want to engage in non-livestock activities			
50.18.	I have enough money to cover my problems such as drought crisis			

51. Now we will ask you about your resilience to drought effects.

51.1. Have you ever left your village to somewhere DUE TO DROUGHT? (*this doesn't include local migration for cattle grazing and watering*) 1. Yes 0. No →skip 55.6

51.2. If yes, when? *(do not read the options, multiple answers are possible*)

1. Before 10 years
2. Before five years
3. Before 2 years
4. Before a year
5. In the last 12 moths
6. Every dry season
7. Other (specify)_____

51.3. Where did you go? (*do not read the options, multiple answers are possible*)

1. Neighbouring zone within Oromia
2. Neighbouring region
3. Neigbhoring woreda
4. Withing the woreda
5. Kenya
6. Other (specify)_____

51.4. For how long did you stay there? (do not read the options)

1. One year
2. Six month
3. Three month
4. Two month
5. One month
6. Other (specify)_____

51.5. How was the mobility in your recent migration? (*please read the options*)

1. Part of the family
2. The whole family

51.6. Why you were not left your village at drought times? (*multiple answers possible: do not read the options*)

1. Because there was preserved animal fodder and other resources
2. Because there were few cattle
3. Beacause there is water in the vicinity
4. Due to GO/NGO support
5. Fear of conflict
6. Other (specify-_____

52. Was there any family member who has dropped (permanently or temporarily) from schooling due to PROBLEMS ASSOCIATED WITH DROUGHT in the last five years? 1. Yes 0. No →skip 60.2

52.1. If yes, number of individuals dropped schooling? _____

52.2. If no, why? (*multiple answers possible: do not read the options*)

1. Because the family was self-supportive
2. There was no mobility
3. Due to GO/NGO support
4. There were few/no cattle
5. other (specify)

53. If drought happens, how do you rate your ability to resist drought as a household. 3. High 2. Moderate 1. low
54. If drought happens, how do you rate your ability to recover from effects of drought as a household? 3. High 2. Moderate 1. Low
55. Was the household faced/encountered conflict in the past five years? 1. Yes 0. No

55.1. If yes, where was the conflict encountered?

1. Within the locality
2. During mobility to other area (not in their locality)

55.2. What kind of conflict is it?

1. Within clan
2. Between clan
3. Between other ethnic group
4. Other (specify)_____

55.3. What was the reason for the conflict?

1. due to water sharing
2. due to cattle grazing
3. due to farmland ownership
4. during migration
5. other reason (mention)____