



## Research paper

# Status and determinants of poverty and income inequality in pastoral and agro-pastoral communities: Household-based evidence from Afar Regional State, Ethiopia

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## ABSTRACT

This paper analyzes poverty and its determinants and income inequality in pastoral and agro-pastoral communities in Ethiopia. 2295 households from zone 1 and zone 2 of the Afar region were surveyed and examined using the FGT index, the Gini coefficient, and logistic regression. 47.6 percent of the households are poor, with poverty gap index of 0.178 and poverty severity index of 0.092. Food poverty accounts for 33.7 percent with an income gap of Birr 33 per month. Food poverty is highest in pastoral (35.6%) than the agro-pastoral communities (29.8%). 35.6 percent of PSNP non-participants and 32 percent of the participant households are poor. Gender of the household head, family size, access to credit, mobility, participating in safety net programs and local institutions, distance to market and remittances are determining poverty in the area. There is an alarmingly high degree of income inequality (0.592) in the study area. The lowest Gini index (0.433) is found in Koneba district, and the highest index (0.616) is observed in widowed heads of households. Strengthening the poverty reduction programs and introducing diversified income schemes; modernizing local institutions, increase provision of microfinance services, introducing packages specific to women and youth are recommended to address the high poverty and inequality in Afar.

## 1. Introduction

Social protection as a means to reduce and mitigate the risk of drought and disasters and to ensure long-term development has gained prominence over recent decades. In establishing social security systems, countries around the world have different modalities and differing degrees of coverage, with their own stories of success and failure in implementation. Social protection can be viewed as part of a comprehensive and integrated set of measures intended to help people get out of poverty and become part of, as well as beneficiaries of, the development process, to ensure equity for all sections of the population (Giovanetti, 2010; ILO, 2014).

A recent report of the International Labor Organization (ILO, 2014) notes that, in spite of the positive contributions and greater salience of social protection measures, only a small percentage of the world's population (27%) has access to comprehensive social security systems.

In Ethiopia, despite the reduction in the incidence of poverty and its

severity over time, resulting from the implementation of different development policies and strategies, around 30 percent of the population is still living below the poverty line (MoFED, 2013).

In 2005, aiming to enhance the overall welfare of society, the Ethiopian government, in collaboration with multiple stakeholders, introduced the Productive Safety Net Program (PSNP), a social security intervention, in the Tigray, Oromia, Amhara and Southern Nations, Nationalities and Peoples (SNNP) regions of the country. However, because of local implementation capacity limitations and concerns about the appropriateness of the program for pastoral communities, implementation of the PSNP was delayed in the Afar and Somali regions. Thus, application of PSNP in the Afar region began later in the form of a pilot program, with significant scaling up in 2009 (World Bank, 2011).

Pastoralist and agro-pastoralist communities live in the arid and semiarid rangelands of the south and east, and they comprise nearly 13 percent of the population, while these areas constitute about 63% of the country's land mass (MoARD, 2009). Mobility is fundamental to

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pastoralists' strategies for coping with unpredictable rainfall and livestock diseases, as well as ensuring the sustainable use of scarce natural resources (Stark, Terasawa, & Ejigu, 2011).

Evidence shows that poverty in Ethiopia is much more widespread and severe among pastoralists and agro-pastoral households. In the Afar Region, nomadism is extensively practiced and is the main livelihood. Comparing progress regarding poverty reduction since 1995/96, when official poverty level data began to be systematically compiled, regions which at that time had higher levels of poverty than Afar Region have shown more rapid improvement.

Recent records show that 36 percent of the population of Afar region lives below the official poverty line (MoFED, 2012). But, research carried out in certain districts of Afar Region indicated that the extent of poverty in pastoral and agro-pastoral communities is as high as 64.8 percent of the population (Sirajea & Bekeleb, 2011).

Many studies have demonstrated that social safety net programs have a significant effect on reducing income poverty. However, empirical studies in Ethiopia, as well as in other countries, have shown conflicting results regarding the impacts of programs. Even though both the incidence of poverty and the poverty gap have substantially declined over time in rural and urban areas, poverty and food insecurity remain widespread and severe. Moreover, poverty remains much more extensive and severe among pastoralist and "semi-pastoral" households (MoFED, 2010).

There is an insignificant number of research works focusing on poverty, income distribution and the effect of social protection on livelihood in the Afar region. The harsh Afar environment, together with a lack of resources and limited local research capacity, has discouraged researchers and made it difficult to conduct large-scale, systematic research work in the Afar region. This study intends to address these gaps in the literature through an in-depth investigation impact of current social protection program on poverty and income inequality, in the pastoral and agro-pastoral communities of Afar Region.

## 2. Empirical literature

### 2.1. Incidence of poverty in pastoral communities

Pastoralist communities' livelihoods and welfare depend primarily on livestock herding and production. The level of poverty is directly related to the availability of livestock and to the type of livestock owned (or herd composition). Most empirical studies carried out in pastoral communities report that there is a high level of poverty, a high poverty gap index and a high poverty severity index, in comparison to agro-pastoral and farming rural households (Ogato, Boon, & Subramani, 2009).

In Ethiopia, food insecurity and hunger remain the greatest concerns in almost all pastoral regions. This implies that the poverty situation in these areas has not seen significant change over the years, in contrast to the non-pastoral areas in the country, which have seen significant change (Mohammed, 2012). Policymakers and service providers tend to be less responsive to pastoralist communities than they are to other communities. Even though there have been improvements in all aspects of governance, in comparison with the situation under previous governments (those of the Imperial and Derge eras), the pastoral communities are still highly marginalized and less accessible. They have been poorly served in terms of the provision of social services and this is one factor in the high level of poverty observed. The incidence of poverty in the pastoral communities is high and this poverty has also persisted for many years. There is also some evidence that the pattern of poverty is changing. An analysis of Shinile zone, in the Somali region, found that poor and very poor pastoralist households have emerged, but the below-medium wealth rank has disappeared, which is evidence that poverty has increased over time. A continuous increase in the level of poverty in the area has been facilitated by the failure or "miss-functioning" of traditional coping mechanisms, with increasing

environmental and rangeland degradation and a lack of national policies to help curtail or address these problems (Kassahun, Snyman, & Smit, 2008).

As we have noted, in the pastoral and agro-pastoral communities of Ethiopia, livestock herding and livestock products enable households to generate income and maintain household consumption. But, the number of heads of livestock per household has declined for various reasons beyond the control of the pastoralists, including drought and disease. As a consequence, households have been forced to diversify their livelihoods, going into crop production, petty trade, firewood and charcoal production and wage employment, among other things. Thus, these are not positive choices to take advantage of new opportunities, but a crisis response to the decline in livestock numbers and the associated incomes.

Research has been done that compares the incidence of poverty among and/or between pastoral, agro-pastoral and farming communities. This comparative work has generally shown a higher level of poverty for pastoral households compared to agro-pastoralist and farming households. In research carried out in the Borana zone of Ethiopia, in 2005, a higher level of poverty was observed in agro-pastoralist communities than among the pure pastoralist households. This research revealed that farming activities had been adopted by agro-pastoralists in order to cope with the decline in consumption resulting from the loss of their livestock (Gemtessa, Emanu, & Tiki, 2005). More recently, research carried out by Shibru, Muktar, Haji, and Yohannes (2013) in Somali region found that there is a high level of poverty (67%) in the agro-pastoral communities of Dembel district.

The picture is similar elsewhere in the region. A study carried out in Kenya in Turkana and Mandera found that 67% of the sampled pastoralist households were living below the poverty line, while 45 percent of agro-pastoralists were living below the required life-sustaining calorie intake per adult equivalent (Watete, Kogi-Makau, Njoka, & MacOpiyo, 2014). The highest level of poverty was recorded in Turkana (71%) and 58 percent of the sampled households were considered poor, as they were living below the standard minimum required calorie intake (Ibid).

There has been some empirical research on poverty in Afar Region. Using FGT measures of poverty and a sample size of 180 households in Aysaita district of the agro-pastoral communities of Afar Region, research conducted by Abubeker, Ayalneh, and Assefa (2012) found that 52.5 percent of households were living under the poverty line, with a poverty gap index 0.16 of and a poverty severity index of 0.07. An analysis employing the calorie intake method on cross-sectional data from 120 pastoral households in Chifra found that 64.8 percent of households were living below the poverty line, while the remaining 35.2 percent were food secure households (Sirajea & Bekeleb, 2011).

### 2.2. Determinants of poverty

In analyzing pastoral poverty, it is important to bear in mind a number of particular features of pastoral communities. Pastoral and agro-pastoral communities are exceptional in terms of the unique environment that they live in, their exposure to the adverse effects of climate change, and their own unique cultural features. They are also characterized by particularly high levels of population growth and a low level of productivity in their principal economic activities. Here, it is useful to review the factors in pastoral poverty that others have identified, in research conducted in Ethiopia and elsewhere.

Empirical studies have identified a range of determinants of poverty in pastoral communities. Households in pastoral areas are characterized by limited resources, low incomes, a low level of human and social capital, as well as limited access to markets and service institutions, including those for credit, extension and plant protection (Ogato et al., 2009).

Using a binary logistic regression model with data from 240 randomly selected agro-pastoral households, Shibru et al. (2013) found

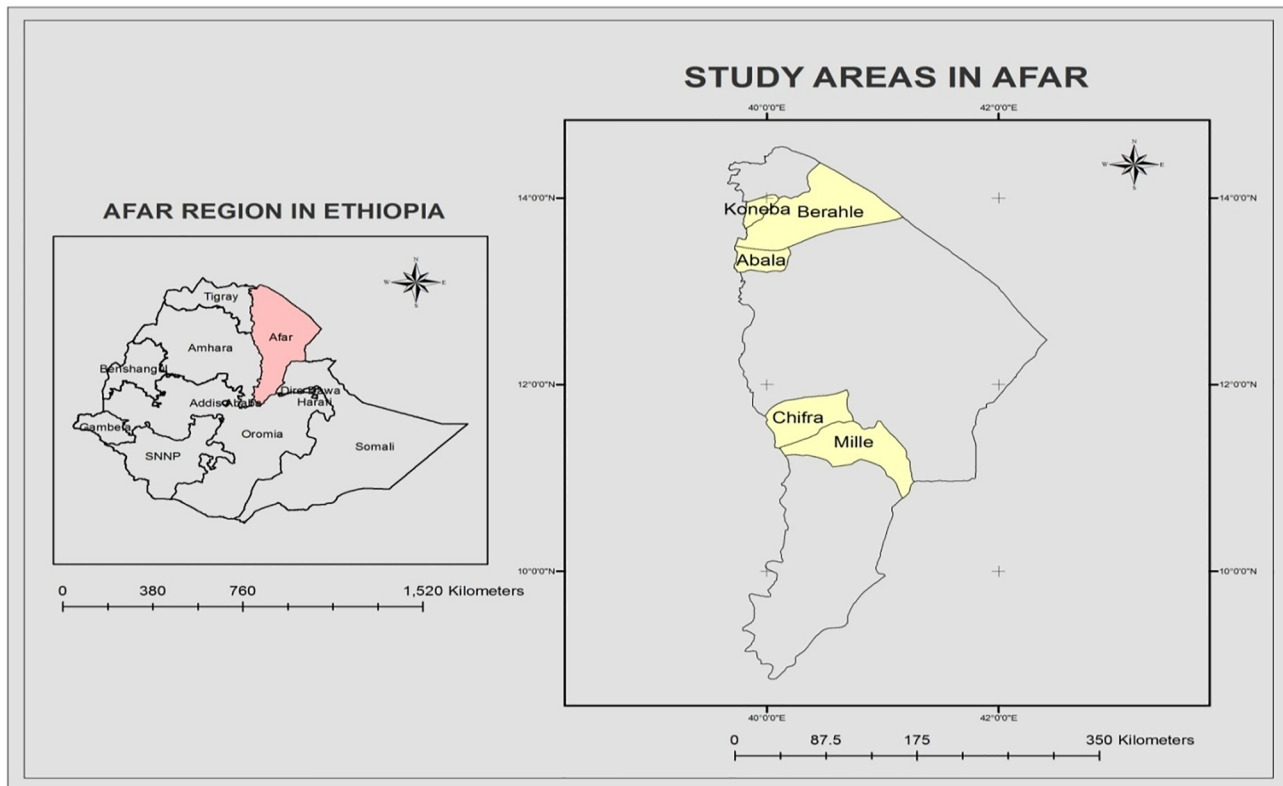


Fig. 1. Administrative map of Afar Region and sampled districts.

that the availability of irrigation services, distance to market center, farmland size, participation in non-farm opportunities, educational level, livestock ownership and herd diversification all had notable impacts on the likelihood of a household being poor in Dembel district.

Research carried by [Abubeker et al. \(2012\)](#) employed a tobit regression model to identify the determinants of household poverty in the agro-pastoral communities of the Aysaita zone of the Afar Region. They found that herd diversification, access to irrigated land, access to marketplace and forage are statistically significant variables (0.01) affecting the incidence of poverty.

Empirical research carried out by [Sirajea and Bekeleb \(2011\)](#) confirmed that family size (1.81), age of household head (0.174), the dependency ratio (2.41) and experiencing livestock disease (2.7) were factors that negatively affect the food insecurity status of pastoral households, while, herd size ( $-0.54$ ), income from livestock production ( $-0.001$ ) and non-farm income ( $-0.012$ ) were positively associated with the food security level of pastoralists in Chifra. In a study conducted in 2013, the incidence of poverty in the agro-pastoral and nomadic communities of the Southern region of Ethiopia has been shown to be influenced by the family size of the household, size of land owned, distance to market and the availability of extension services and the yearly income of the household. In this context, external support and policy interventions to strengthen extension services on animal feed and water harvesting, strengthened marketing and the expansion of animal health and family planning services would be key elements to poverty reduction. In this study, contrasting sharply with similar research in pastoral and agro-pastoral communities elsewhere, households variables like age, sex, and physical assets expressed by the value of livestock owned, were not found to be statistically significant variables in determining whether or not the household was poor ([Aduugna & Sileshi, 2013](#)). That is to say, this study surprisingly found that the value of livestock owned per household member was not a determinant of household poverty.

Using a per capita daily income poverty line as a measure of the

level of poverty and a binary logistic regression model, one study analyzed the determinants of transient poverty among agro-pastoral communities in the Njemps Flats of Baringo district in semi-arid Kenya. Here, the study found that the most important factors affecting poverty among agro-pastoral communities were the basis of alternative livelihoods, family size, distance to the nearest market, and the number of livestock owned ([Yazan, Nyariki, Wasonga, & Ekaya, 2012](#)). An earlier study in Kenya's Kajiado District, using a 1997 data set from the Kenya Welfare Monitoring Survey and with complete geographic coverage provided by a 1999 Kenya Population and Housing Census, found that grazing land potential, livestock density, distance to the main town, road density, access to education, access to security, soil fertility and potential for agriculture are the factors affecting poverty in the area ([Kristjanson, Radeny, Baltenweck, Ogotu, & Notenbaert, 2006](#)).

In a 2004 study conducted in Tibet (China), the pastoralist communities featured the highest incidence and intensity of poverty. This poverty was exacerbated by a host of factors, including the harsh environment, with very cold temperatures, infertile soils, drought, low levels of agricultural productivity, a lack of access to finance, limiting the use of modern technologies, low levels of education, high population growth and large family sizes ([Daniel, 2004](#)).

### 3. Data and method of estimation

#### 3.1. Description of the study area

Pastoralists and agro-pastoralists in Ethiopia are mainly located in the arid and semiarid areas of the south and east of the nation, comprising around 13 percent of the population and 63 percent of the country's landmass.

The Afar Regional State, one of the nine Federal states of Ethiopia, consists of 72,053 sq. km., with a population of around 1.6 million (estimated in 2012). Compared with other regions, it is a vast and sparsely populated area, with 22.2 persons per square kilometer,

**Table 1**  
Sample size by zone.

Zone	District	Freq	Percentage
Zone 2	Aba'la	376	16.38%
	Berhale	552	24.05%
	Koneba	365	15.9%
Zone 1	Chifra	394	17.17%
	Mile	608	26.49%
	Total	2,295	100

Source: SPIDA survey 2017.

Ethiopia's lowest area in altitude, situated in the north-eastern part of the country (CSA, 2007). The Afar region is located between 39°34' and 42°28' East (longitude) and 8°49' and 14°30' North (latitude). It is characterized by high temperature (25 °C–48 °C) and flat landscape with an altitude range of 116 m below and 1600 m above sea level. Afar National Regional State is structured in five zones, 32 wereda, 28 towns, and 401 rural and urban Kebele. It borders the countries of Eritrea in the north-east and Djibouti in the east, as well as Ethiopia's Somali regional state in the south-east, Tigray in the north-west, Oromia in the south and Amhara in the south-west (see Fig. 1).

Eighty-seven percent of the population lives in rural areas, with pastoral and agro-pastoral livelihood systems. Women make up about 44% of the population, and 57% are men. Regarding the age profile, 43% of the population is under 15 years old. There are 247,284 households with an average family size of 5.7 persons, which ranges from 3.9 in urban areas to 6.1 in rural areas (CSA, 2008).

While the population is overwhelmingly Afar, there is a degree of ethnic diversity in the Afar region. In 2008, the ethnic mix was as follows: Afar 91.8%, Amhara 4.5%, Argoba 0.92%, Tigrayan 0.82%, Oromo 0.7%, Wolaita 0.45%, and Hadiya 0.013% (CSA, 2008). Concerning religious composition, 96% of the regional population are Muslim and 3.86% Orthodox Christian, with a small share of Protestants (0.43%), Catholics (0.09%) and others (0.02%). About 90% of the population bases their livelihoods on livestock production, with limited irrigated agriculture along the river basins and in low-lying areas. For the Afar, the basic livestock units are cattle, camels, goats, sheep, and donkeys. In general, the Afar communities participate in livestock production not only for economic reasons but also because of its social and cultural significance, and its relationships to social values and the kinship systems as a whole (Getachew, 2001).

The study focuses on two zones of the Afar region, zone 1 and zone 2, which border the Tigray and Amhara regions (Fig. 1).

### 3.1.1. Zone 1

According to Central Statistical Authority's report (CSA, 2007), zone 1 has an estimated total population of 410,790, of whom 224,656 were men and 186,134 women. While 82,886 or 20.18% of the population were urban residents, a further 178,557, or 43.47%, were pastoralists. The zone covers an area of 30,242.10 square kilometers, and it has a population density of 13.58 persons per square kilometer. Asayita is the largest town and capital of zone 1. Geographically, Zone 1 borders in south, southwest, west, northwest, and north to zone 3, zone 5, Amhara regional state, zone 2, and zone 4 respectively. Zone 1 also borders to countries Eritrea and Djibouti in the northeast and east, respectively.

### 3.1.2. Zone 2

Zone 2 has a population of 391,467 (estimated in 2012), and 55.9 percent are male, while 44.1 percent are female. The total area of the zone is 18,068.34 square kilometers, with a density of 22 people per km<sup>2</sup>. Only 7.5% of the population is living in urban areas. Zone 2 is bordered to the south by zone 1, to the southwest by zone 4, to the west by Tigray Region, and internationally to the northeast by Eritrea. The administrative center and capital of zone 2 is Aba'la (CSA, 2007).

## 3.2. Sampling and source of data

This study employed a mixed approach with an emphasis given to a quantitative household survey supplemented by qualitative research. Quantitative research was used to examine micro-level evidence on the poverty, determinants of poverty and income inequality. The most important source of information for the study was data collected using both structured and semi-structured questionnaires, complemented by interviews, focus group discussions and field observation. The data was collected on August 2016 which covered detailed household features, consumption expenditures, income, access to different social services, gender empowerment, local institutional arrangements and others. Using a multi-stage random sampling technique, five pastoral and agro-pastoral districts and fifteen villages were covered in this study. A three-stage random sampling method was also employed to select representative households from the respective communities. The selection of respondents through multi-stage sampling involved three steps:

- First, respondent households were classified based upon the administrative structure, and the sample size was allocated proportionately to districts based on their population size.
- Then, villages in each district were classified based upon their livelihood systems, that is, pastoralist, agro-pastoralist, and mobile pastoralists. Three villages, two pastoralists, and one agro-pastoralist were selected randomly from each district, and the sample was again allocated proportionately, according to their populations.
- Finally, households were selected using a systematic sampling procedure from each already randomly selected village.

Accordingly, based upon the projected population sizes of districts in 2016, the total sample size of 2500 households was selected from 5 districts and 15 villages. Table 1, below, shows the number of sampled households for each district. However, because of missed values and unfilled questionnaires, a total of 2295 (92%) families were used for analysis.

As Table 1 indicates, 56.34 percent of the total respondents were from Zone 2, while the remaining 43.66 percent of respondents were from Zone 1. 26.49 percent of respondents were drawn from Mile district, followed by 24.05 percent, 17.17 percent, 16.38 percent and 15.90 percent for Berhale district, Chifra district, Aba'la district, and Koneba district, respectively. 66.7 percent of the sample size are predominantly pastoral and 33.3 are agro-pastoral communities (Table A4). Besides, 45.93 percent of the pastoralist had relatively less frequency of moves for search of pasture and water sources for their animals but 54.07 percent of them were nomads.

### 3.2.1. Sample share of the beneficiary and non-beneficiary households

Looking at sample households by their participation in the Productive Safety Net Program (PSNP), 51.37 percent were participants in the program (of various types), and the remaining 48.63 percent were non-participants. The sample size was allocated proportionately based upon the number of participants and non-participants in the area.

Fig. 2 shows the sample distribution of households based on PSNP participation. The total number of PSNP participants was 1179 (51.37%) and non-participants numbered 1116 (48.63%).

## 3.3. Methods of data analysis

A quantitative household survey provides the basis for this study, aiming to assess various dimensions of poverty, in particular, its distribution and severity.

A binary logistic model is employed, and various determinants of poverty are analyzed. Targets included the sources of income and its distribution, the impact of the PSNP on consumption and assets, as well as other key variables.

Primary data collected in the sample survey encompassed

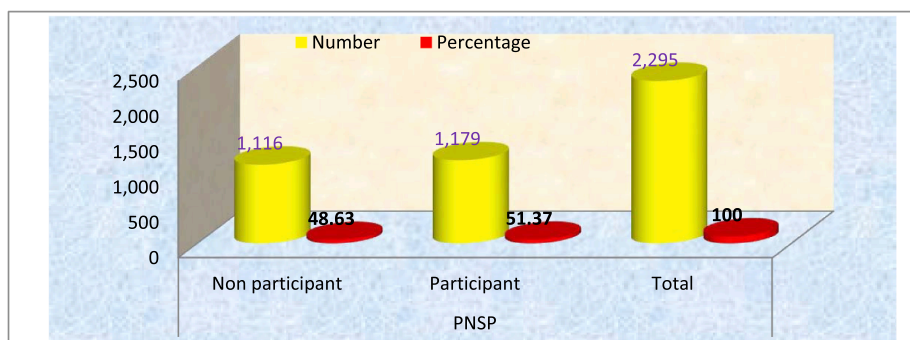


Fig. 2. Share of PSNP participant and non-participant households in the sample. Source: SPIDA survey 2017.

information on social and demographic characteristics, consumption, income, social services, livestock ownership, and institutional variables. Quantitative data analysis involved the calculation of the Foster-Greer-Thorbecke (FGT) index and the application of an econometric to assess household poverty. The Gini coefficient was employed to measure income distribution.

### 3.3.1. Poverty analysis with Foster-Greer-Thorbecke indices

We used the expenditure approach, with a family of poverty indices, developed by Foster, Greer, and Thorbecke (1984), to analyze the status of poverty among PSNP beneficiaries and non-beneficiaries. For the poverty line, we used a calorie intake of 2200 kcal per adult equivalent, identified as the lowest amount of calories needed to sustain an adult equivalent for a day in Ethiopia (MoFED, 2008; Fredu, 2008).

The incidence of poverty was examined using the three FGT Measures. The Head Count Index ( $P_0$ ) reflects the percentage of the poor, the Poverty Gap Index ( $P_1$ ) depicts the extent to which households are living below the poverty line (the poverty gaps) and the Poverty Severity Index ( $P_2$ ) measures not only the poverty gap but also its distribution among the poor (World Bank Institute, 2005). So, we are aiming not just to assess how many people are poor, but also how poor they are (about the established poverty line).

Where  $Z$  is the poverty line,  $Y_i$  is the actual expenditure (adult equivalent) of individuals below the poverty line,  $n$  is the number of people,  $q$  is the number of poor people (usually those below the poverty threshold),  $\alpha$  is poverty aversion parameter, a weighting that the researcher can set at 1, 0 or 2,<sup>1</sup> the FGT index or  $P_\alpha$  (World Bank Institute, 2005; Maru, 2004; Tesfaye, 2006; Fredu, 2008; Tasew, Hoddinott, & Dercon, 2008), is given by:

$$P_\alpha(Z, Y) = \frac{1}{n} \sum_{i=1}^q \left[ \frac{Z - Y_i}{Z} \right]^\alpha \quad (1)$$

This is, roughly speaking, the number of poor households multiplied by the gap between each household's expenditure and the poverty line, divided by the total number of families. If the value of alpha is set at zero ( $\alpha = 0$ ), then the FGT ( $P_\alpha$ ) becomes merely the Head Count Index ( $P_0$ ), the share of the population that lives below the poverty line. (Setting alpha to zero directly reduces the expression in square brackets to 1, since anything set the power zero becomes equal to 1. And we are left with  $q$ , the number of poor people, divided by  $n$ , the number of people). When  $\alpha$  has a value of 1,  $P_\alpha$  is the Poverty Gap Index ( $P_1$ ), which gauges the intensity of poverty. (It is the average poverty gap for a household in the sample divided by the poverty line). When  $\alpha = 2$ ,  $P_\alpha$  becomes the poverty severity index. This takes an average of the squared poverty gap for each household, and gives greater weight to

<sup>1</sup>  $\alpha$  assumes values 0, 1, or 2 to determine the degree to which the measure is sensitive to the level of deprivation for those below the poverty line. Higher values of  $\alpha$  give greater weight to the poorest and the degree to which they fall below the poverty line (WBI,2005).

how much a family falls below the poverty line).

Household expenditure is considered an adequate measure of household welfare in developing countries as it is better able to capture a household's consumption capabilities (Grootaert, 1986). There are two main reasons to use consumption expenditure as compared to net earnings from various livelihood studies. First, some components of household consumption are usually measured more accurately than income, and second, consumption is less susceptible to income volatility, especially in the context of rural households in developing countries, which strongly depend on agricultural income.

### 3.3.2. Determinants of poverty in a logistic regression

Econometric models are useful tools, but the accuracy research results rely significantly on having the proper identification of the model.

To determine the factors influencing pastoral and agro-pastoral poverty, we applied a logistic regression (essentially a regression where the explanatory variables are trying to answer a "yes or no" question), with the explained variable (poor or non-poor) being the dichotomous variable<sup>2</sup>. If the explanatory variables are dichotomous ("yes or no," dummy variables), the Logit model is the appropriate one (Gujarati, 2006).

The independent variables used in the analysis were demographic variables (sex, age, marital status of the head, family size), educational level, PSNP participation, health, participation in community affairs, access to water sources, distance to market, access to animal health services, credit services, savings, participation in local institutions, experiences of shocks and area of residence.

So, as we are seeking to explain a binary status (i.e., being poor or non-poor), let the underlying response variable  $y^*$  is defined by the regression relationship (Gujarati, 2006; Tesfaye, 2006):

$$y_i^* = \beta_i X_i + U_i \quad (2)$$

where  $y_i^*$  is the status of household  $i$ , is a set of coefficients for each explanatory variable and  $X_i$  is the set of explanatory variables (determinants),  $U_i$  is the error term and  $i$  represents households that run from 1 to  $n$ .

When  $y^*$  is unobservable, we only observe a dummy variable  $y$  explained by:

$$y = 1 \text{ if } y^* > 0, \text{ and} \\ y = 0 \text{ otherwise} \quad (3)$$

Here, the response variable assumes two values, 1 if the household is poor, 0 if not. The likelihood of the family being poor rests on a group of variables represented by  $X$  so that,

$$P(y_i = 1) = F(\beta X) \text{ and} \\ P(y_i = 0) = 1 - F(\beta X) \quad (4)$$

<sup>2</sup> A Logit model is applicable for qualitative binary variables that have two outcomes, i.e.  $Y=1$  if the head is poor and  $Y=0$  if non-poor.

where F is the cumulative distribution function for the error term  $U_i$ .

Therefore, our Logistic regression model is given by:

$$\text{Logit}(P) = \ln \left[ \frac{P}{1-P} \right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \tag{5}$$

where  $\beta_1, \beta_2, \dots, \beta_n$  are the predictor variables, the age of household, size of the household, literacy level of the head, etc., and P is the probability that the household is poor.

### 3.3.3. Income inequality

Ensuring equity in incomes is an essential aspect of interventions that aim to enhance the welfare of communities. Interventions that address income inequality are a vital element in poverty reduction programs undertaken in the Least Developed Countries (LDCs), where addressing absolute as well as relative poverty is vital in maintaining and promoting social cohesion.

Here, we assessed income inequality in the pastoral and agro-pastoral communities using the Gini coefficient (GC), the most commonly used measure of income inequality. The Gini gauges the share of the total income of the population that is earned by different segments of the people.

Graphically, the share of total income is presented on a vertical axis, and the corresponding percentage of the population is earning that income along with a horizontal axis. If  $X_i$  is a point that lies on the horizontal (X-axis) representing the cumulative percentage of population and  $Y_i$  is a point on the vertical (Y-axis) representing the cumulative rate of expenditure (our measure of income here), then the Gini-coefficient (GC) is given by the formula below (World Bank Institute, 2005);

$$\text{Gini}(GC) = 1 - \sum_{i=1}^N (X_i - X_{i-1})(Y_i + Y_{i-1}) \tag{6}$$

where  $X_i$  is the cumulative percentage of the population,  $Y_i$  is the value of the cumulative percentage of income and  $N$  is sample size.

The Gini index can be straightforwardly calculated from the household income, expenditure or any welfare indicating data after sorting the observations. For the Gini coefficient, inequality varies from 0 to 1, with zero showing that income is (entirely) equally shared and distributed. When the GC approaches one, income is skewed to specific groups, with an unfair distribution.

The distribution of total household income and expenditure, income per capita and spending per adult equivalent show the disparities across districts surveyed and also between the poor and the non-poor pastoral and agro-pastoral communities.

## 4. Estimation and results

### 4.1. Status of poverty-Who are the poor?

To identify the poor households, setting the poverty line is required. The Cost of Basic Needs (CBN) approach was employed to determine the poverty line. This approach is used for the availability of prices of goods that the poor consume and for its ability to show the real expenditure behavior of households, as well as the consumption patterns of households. Using the CBN, the following steps were employed to obtain the food poverty line (World Bank Institute, 2005):

- i. Identify and select the food items commonly consumed by the majority of the poor. 11 food items (Table A1) were identified.
- ii. Each food item in the bundle of goods is weighted with the appropriate unit of measurement (kilogram and liter).
- iii. Each unit of the food items consumed by a household in a month is divided by the corresponding number of adult equivalent units-AEU (Table A5) members of the household to get the number of kilograms each adult individual gets in a month.

iv. Sum all food per adult equivalent units consumed in a month to get the monthly requirement and divide by 30 days to compute the daily requirements of food for each adult equivalent unit in the household.

v. Assuming 2200 kcal per adult equivalent to being the minimum calorie required per adult equivalent per day in Ethiopia (MoFED, 2008; MoFED, 2012), the researchers estimated the cost of meeting this food energy requirement.

The level of poverty was measured using the Head Count Index ( $P_0$ ), Poverty Gap Index ( $P_1$ ) and Poverty Severity Index ( $P_2$ ). The headcount index measures the percentage of the households who fall below the poverty line. The poverty gap index measures the extent to which low-income families are living below the poverty line. The poverty severity index reflects not only the poverty gap but also the degree of inequality between the households.

#### 4.1.1. Basic needs and food poverty

The incidence of poverty was analyzed using the total food poverty line Birr 389.2 per adult equivalent per month, and further discussion is based on the food poverty line of Birr 289.21. For various reasons, economic and non-economic factors, the non-food consumption expenditure of the households is considered to be high as it accounts for more than 25 percent of the total spending of the families. Most importantly, the cost of transportation is the primary input influencing the price of manufactured goods and services needed by households.

Table 2 shows that 47.6 percent of respondents are living below the minimum calorie intake required. The poor households are 17.8 percent (Birr 69.8) below the poverty line with a poverty severity index of 0.092. Zone2 has the highest level of poverty (53.1%), a poverty gap index of 0.197 and a poverty severity index of 0.099. Households in zone 1 are characterized by a headcount index of 0.335, an income shortfall of 0.127 and a squared poverty index of 0.076.

All FGT poverty measures also varied across districts. Koneba has the highest level of poverty (69.6%), followed by Aba'ala (56.6%) and Barahle (39.6%). The lowest poverty headcount index was recorded in Chifra (30.5%), followed by Mile (35.5%).

Thus, our findings are consistent with those research studies carried out on poverty and livelihoods in Ethiopia's pastoral and agro-pastoral communities (Mohammed, 2012; Ogato et al., 2009; Shibru et al., 2013). It is confirming the existence of a high level and severity of poverty. In what follows, we will in the primary make use of the food poverty line to discuss the food security and food poverty status of

**Table 2**  
Total poverty across zones and districts.

Category	District	Head Count Index (P0)	Poverty Gap Index (P1)	Poverty Severity Index (P2)	Total Poverty Line (TPL)
Zone	Zone1	0.335 (0.015)	0.127 (0.008)	0.076 (0.006)	389.2
	Zone 2	0.531 (0.014)	0.197 (0.007)	0.099 (0.005)	389.2
	Aba'ala	0.566 (0.026)	0.203 (0.012)	0.098 (0.008)	389.2
	Berahle	0.397 (0.021)	0.131 (0.009)	0.059 (0.005)	389.2
District	Chifra	0.305 (0.023)	0.112 (0.012)	0.068 (0.01)	389.2
	Koneba	0.696 (0.024)	0.292 (0.014)	0.159 (0.011)	389.2
	Mile	0.355 (0.019)	0.137 (0.01)	0.081 (0.008)	389.2
	Population	0.476 (0.011)	0.178 (0.005)	0.092 (0.004)	389.2

Values in brackets are standard deviations.  
Source: SPIDA survey, 2017.

pastoral and agropastoral households.

Using Birr 289.21 as the food poverty line, 33.7 percent of the respondents were found to be living below the poverty line, with a poverty gap index of 11.4 percent<sup>3</sup> and a poverty severity index of 5.4 percent. When we investigated the incidence of poverty across the zone, the highest level of poverty (38.4%) is recorded in zone 2, with an income gap index of 0.125 and a squared poverty gap index of 6 percent (Fig. 3).

21.7 percent of respondents in Zone 1 were living below the poverty line, with an income gap index of 0.087 and a poverty severity index of 0.056. Thus, Zone 2 of the Afar region has the highest headcount index, poverty gap, and the squared poverty gap index, when compared with Zone 1. As depicted in Table 3, the highest incidence of poverty was observed in the Koneba district, with a headcount index of 0.584, a poverty gap index of 0.213, and a poverty severity rate of 0.105. In this district, more than fifty percent of respondents are living with a level of consumption below the minimum calorie intake required to sustain life.

This district not only has the highest percentage of poor but also has a larger poverty gap and a high poverty severity index. On average, the poor households in this district need Birr 61.6 per month per adult equivalent to lift them to a point where they get the minimum calorie intake required per day. This amount of money is 186.7 percent higher than the amount of money required to raise the poor households to the poverty line.

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The second highest degree of poverty is recorded in the Aba'la district, which had a poverty headcount index of 0.391, poverty gap index of 0.102 and a squared poverty gap index of 0.044. A poverty headcount index of 0.268 characterizes the Barahle district, a poverty gap index of 0.078 and a squared poverty gap index of 0.034. In Chifra district, 25.6 percent of households were living below the poverty line, with an income gap index of 0.087 and a poverty severity index of 0.042.

The lowest level of poverty is observed in Mile district. Here, 24 percent of the surveyed households are poor, living a full 9 percent below the poverty line. The poverty severity index was 0.05. In this district, pastoralists need Birr 26.02 per adult equivalent to reach the minimum required calorie to sustain life. The amount of money corresponding to the poverty gap index in Mile is Birr 6.95 less than the population income shortfall and 57.8 percent less than the income shortfall of the district that features the highest incidence of poverty (Kuneba).

## 4.2. Poverty and demographic variables

### 4.2.1. Poverty and gender of the head of the household

The magnitude, depth, and severity of poverty differ across families within a particular community or section of that community. Many studies on pastoral and agro-pastoral communities support the idea that households headed by females have higher poverty, poverty gap, and severity indices.

As depicted in Table 4, 37.2 percent of the female-headed households in our survey were unable to cover the amount of food required to sustain life. These households are situated 12.8 percent below the poverty line with a severity index rate of 0.065. Male-headed

households have a lower level of poverty than their female-headed counterparts. The incidence of poverty measured as the poverty headcount index is 0.307, with an income shortfall index of 0.112 (requiring Birr 32.4 to lift these households to the poverty line level) and a squared poverty gap index of 0.053. In this study, we found that female-headed households have a headcount index of 0.065 and a higher level of poverty, the poverty gap index and poverty severity index than male-headed households.

### 4.2.2. Poverty and marital status

In poverty studies, the marital status of the household head is generally recognized as a demographic variable. The marital status of the head of the household has both economic and social influences. As a result, LDC governments increasingly tend to consider this question in their development agenda and policy interventions.

In our research, as poverty is influenced by the marital status of the head of the household, due attention has been given to this factor in assessing the magnitude of and determinants of poverty. In our study, the highest poverty headcount index (0.434) was observed in married households, with a poverty gap level of 0.151 and a severity index of 0.073, while the lowest level of the incidence of poverty (28%) was recorded in single households, with an income gap index of 0.9 and a poverty severity index 0.044 (Fig. 4). 37.7 percent of the widowed and 33% of the heads of the divorced households are poor, and unable to attain the required minimum calorie intake for a healthy life.

The high incidence of poverty in married households might well be a consequence of large family sizes. 75% of the married, 14% of the widowed and 7% of the divorced have a family size greater than 4. High dependency ratios aggravate household poverty. Another factor is the lack of additional jobs for household members.

### 4.2.3. Poverty and community variables

The Government has allocated a significant percentage of its budget to social services, education, and health, as well as to water supply, electrification, irrigation, improved farm, and pastoral inputs and to social protection interventions programs, like the productive safety net program, which target the poor, vulnerable and disadvantaged.

**4.2.3.1. Poverty, livelihood systems, and program participation.** The Ethiopian government has introduced different programs intended to improve the livelihoods of households, enhance their access to food during times of food shortages, and protect household assets, especially livestock from depletion. The underlying goal of the Productive Safety Net Program is to maintain the consumption level of poor households.

Depending on the livelihood system, the intensity and dependence on livestock rearing and/or farming practices, and nature and intensity of moves, the Afar region features both pastoral and agro-pastoral livelihood systems, each with a distinct way of life. Both are included in our study. As indicated in Fig. 5, the highest level of poverty (35.6%) is in the real pastoral communities rather than in the agro-pastoralist communities, who have a poverty headcount index of 0.298. The pastoral households' had a higher poverty gap index of 0.11 and the squared poverty gap index of 0.056. The agro-pastoral communities were found to have an income shortfall index of 11.2 percent and the severity of the poverty index of 0.065. Our comparative analysis of poverty based on the livelihood system of respondents contradicts the study conducted by Gemtessa et al. (2005), which assessed the pastoral and agro-pastoral communities in the Borena zone.

Participation of households in such programs and the provision of the essential social services are expected to make a positive contribution to reduce the level of poverty and enhance the consumption level of households. For the PSNP in Afar Region, we found a significant difference between the percentages of poor among participating and non-participating families.

The lower level of poverty headcount index (0.32) was recorded in the households who are participating in the program. These poor

<sup>3</sup> on average, Birr 32.97 per adult equivalent is required to lift the poor to the level of the poverty line. This is a useful gauge of how much is required regarding the transfer.

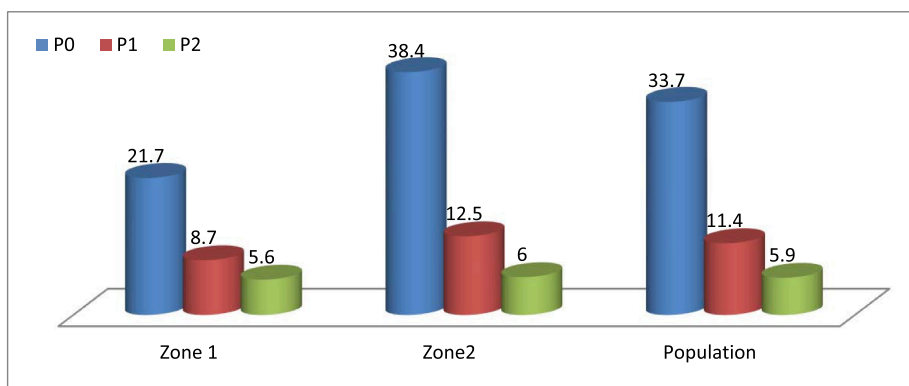


Fig. 3. Incidence of poverty by zone. Source: SPIDA survey, 2017.

**Table 3**  
Level of Poverty across Districts.

District	Head Count Index (P0)	Poverty Gap Index (P1)	Poverty Severity Index (P2)	Food Poverty Line
Aba'ala	0.319 (0.024)	0.102 (0.009)	0.044 (0.005)	289.21
Berhale	0.268 (0.019)	0.078 (0.007)	0.034 (0.004)	289.21
Chifra	0.256 (0.022)	0.087 (0.009)	0.042 (0.006)	289.21
Koneba	0.584 (0.026)	0.213 (0.013)	0.105 (0.009)	289.21
Mile	0.24 (0.017)	0.09 (0.008)	0.05 (0.006)	289.21
Population	0.337 (0.01)	0.114 (0.004)	0.054 (0.003)	289.21

Values in brackets are standard deviations.  
Source: SPIDA survey, 2017.

**Table 4**  
Poverty and gender of the household head.

Gender	P0	P1	P2	FPL
Female	0.372 (0.016)	0.128 (0.007)	0.065 (0.005)	289.21
Male	0.307 (0.014)	0.103 (0.006)	0.053 (0.003)	289.21
Population	0.337 (0.01)	0.114 (0.005)	0.058 (0.003)	289.21

Values in brackets are standard deviations.  
Source: SPIDA survey, 2017.

and would only require Birr 31 to attain the required calories per month. (It should be noted here that program participants are selected precisely because they are more miserable than non-participant households even to a certain degree for the quota limitation, to begin with).

**4.2.3.2. Poverty and households' access to social services.** In this study, the incidence of poverty was also analyzed by households' access to different social services. For various reasons, households differ in their need or desire to participate in finance and credit facilities. Because of poor infrastructural development and the particular cultural and religious features of the communities, the kinds of credit facilities available in the non-pastoral communities are either not available or have not been fully utilized. Still, households in these pastoral communities have a common practice and tradition of informal credit services, with money provided during times of need, when households face a financial deficit, by other community members family members, relatives, clan leaders, friends or neighbors.

In our study, we found that the magnitude, gap, and severity of poverty differ from households' access to credit facilities in the pastoral and agro-pastoral communities in Afar Region. Access to financial services is important in enabling households to cover short-term financial constraints, to open new businesses, to buy a farm or non-farm inputs, to buy livestock or breeding stock, or to buy consumable goods. As indicated in Fig. 4, there is a higher level of poverty (34.1%) among

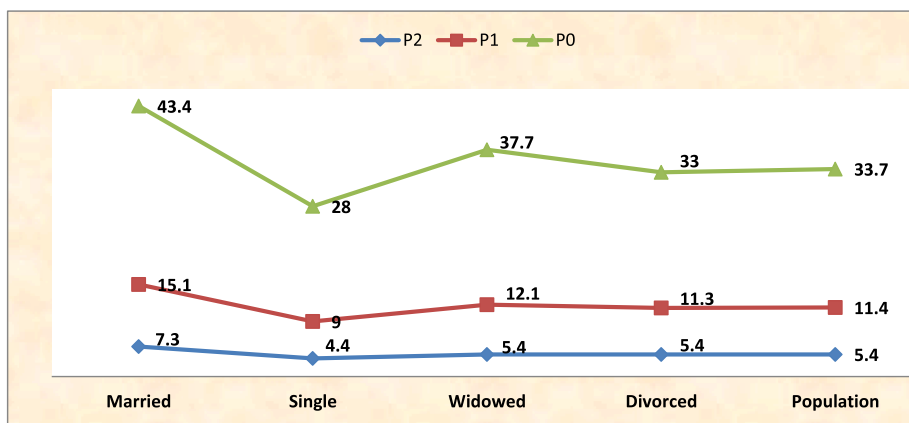


Fig. 4. Poverty and marital status of the household head. Source: SPIDA survey, 2017.

participant households would need Birr 34.7 to lift them to the minimum calorie intake required to sustain a basic life, which is 2 percent higher than the amount necessary for their program non-participating counterparts. Even though 35.6 percent of the program non-participants are poor, they are situated 10.8% below the poverty line

households who do not have access to credit facilities who need Birr 32.5 per month for each adult equivalent to reach the poverty line. Besides, 28.6 percent of the households who are using credit services are living below poverty. Our findings are similar to those of many other studies assessing the role of access to credit facilities. The



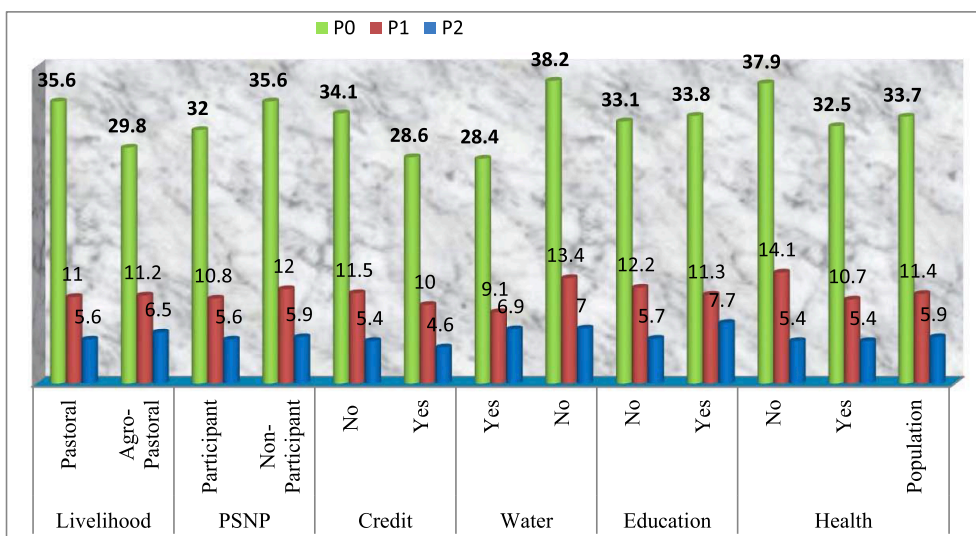


Fig. 5. Poverty and access to social services and livelihood. Source: SPIDA survey, 2017.

existence of a high level of poverty among households who do not have access to financial (credit) services in our study is in line with the findings of Yazan et al. (2012).

38.2 percent of the households who do not have access to safe potable water is poor, living 13.4 percent below the poverty line, with a poverty severity index of 6.9 percent. 28.4 percent of the households who do have access to safe drinking water would require Birr 26.4 to reach the poverty line, and they have a poverty severity index of 0.046. Fig. 6 shows that there is no significant difference between the incidence of poverty among households having access to education nearby and those that do not. 33.8 percent of the households who do have access to education facilities are poor, with a poverty gap index of 0.113 and a squared poverty gap index of 0.057. And 33.1 percent of those who do not have access to education is poor, requiring Birr 35 to attain the minimum required calorie intake per adult equivalent per month, and having a squared income gap index of 0.07. When it comes to health services, we do find a significant difference in the magnitude of poverty by households' access to health services nearby and at lower transport costs. A relatively lower incidence of poverty (32.5%) was recorded in households who have access to health facilities and a higher level of poverty (37.9%), poverty gap and poverty severity index were observed with those who live far from health facilities.

4.2.3.3. Poverty and household mobility. Most pastoral communities

practice seasonal, transhumant movement. Based upon the features of movement that the households experienced, they are further classified as nomads and non-or less mobile pastoralists. This classification is important due to mobility nature of households makes government interventions more complex and challenging to implement. In addition, households may not get the desired supports from the government due to their unexpected moves. This affects the provision of education and health services, as well as the implementation of programs like the one assessed here.

As a result, the provision of social services is minimal, and long distances must be traveled to reach service providers in the pastoral areas.

Compared with the agro-pastoralists, we found that pastoralist households have higher levels of poverty on the three measures. When we compare poverty across pastoral communities, we found that those communities with the highest frequency or degree of mobility recorded the highest incidence of poverty.

As evidenced in Table 5, 38.5 percent of the nomadic communities are poor, with an income shortfall of index of 0.132 (Birr 28.2) and a poverty severity index of 0.061. Compared with the nomads, non-mobile or less mobile pastoralists have a lower level of poverty (30.5%) with poverty gap index of 9.9 percent and a squared poverty gap index of 0.046. (Note that even the “non-mobile” pastoralists are likely to move during harsh dry seasons, or else to have some household

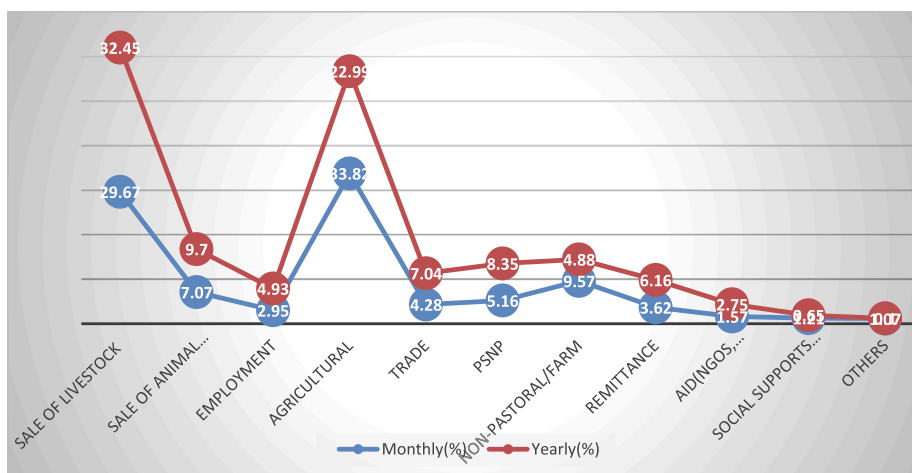


Fig. 6. Monthly and annual source of income of households. Source: SPIDA survey, 2017.

**Table 5**  
Poverty by mobility nature of the pastoral households.

Group	Category	P0	P1	P2	FPL
Pastoralist	Non mobile	0.305 (0.015)	0.099 (0.006)	0.046 (0.004)	289.21
	Nomads (Mobile)	0.385 (0.014)	0.132 (0.006)	0.061 (0.004)	289.21
	Population	0.356 (0.01)	0.114 (0.004)	0.054 (0.003)	289.21

Source: SPIDA survey, 2017.

members march with the animals at different times of the year).

#### 4.3. Econometric model on determinants of poverty

Identifying the particular factors influencing the livelihoods of the community is vital in designing development policies and in enhancing the applicability or appropriateness of interventions. Poverty in the pastoral and agro-pastoral communities is influenced by specific household features as well as community-level variables, and geographical differences, among other things. We applied an econometric model to analyze the determinants of poverty in the pastoral and agro-pastoral communities. When we estimated the model, we found that most of the variables (their association with the outcome) had the expected sign, though half of them were not statistically significant influences on the incidence of poverty in zone 1 and zone 2 of Afar Region. The age of the household head was hypothesized to have a positive association (i.e., old age was expected to be associated with higher poverty), but this turned out to be negative. This result might be due to the support that government, NGOs, other institutions and family members provide to old people.

Table 6 shows the results of the model estimation. Gender of the household head, family size, mobility, the number of household members participating in non-pastoral/farm employment and credit utilization were statistically significant at the 1 percent level. PSNP

**Table 6**  
Determinants of poverty using a logistic model.

Poverty	Odds Ratio	Robust Std. Err.	z	P > z
Age of household head	-0.001	0.001	-0.81	0.419
Sex of household head (1 = male)	-0.060	0.018	-3.36	0.001***
Remittances (1 = yes)	-0.146	0.069	-2.1	0.037**
Saving account (1 = yes)	-0.041	0.051	-0.8	0.423
Local institutions (1 = yes)	-0.056	0.027	-2.07	0.039**
Family size	0.077	0.004	17.5	0.000***
Marital status (1 = Married)	-0.015	0.02	-0.75	0.451
Literacy (1 = literate)	-0.039	0.023	-1.7	0.089*
Asset value	-8.17E-03	6.57E-03	-1.24	0.214
Health access (1 = yes)	-0.021	0.02	-1.05	0.294
Mobility (1 = yes)	0.077	0.017	4.54	0.000***
PSNP (1 = yes)	-0.04	0.02	-2.02	0.043**
Livelihood (1 = agro-pastoralist)	-0.005	0.019	-0.29	0.773
Distance to market	0.011	0.005	2.26	0.024**
Non-pastoral/farm employment	-0.177	0.103	-3.66	0.000***
District (Aba'la district was taken as a benchmark)				
Berhale	-0.058	0.029	-2.03	0.043**
Chifra	-0.141	0.032	-4.47	0.000***
Koneba	0.094	0.037	2.53	0.011**
Mile	-0.084	0.032	-2.65	0.008***
Tropical livestock unit	8.98E-04	6.08E-04	1.48	0.14
Credit Utilization (1 = yes)	-0.088	0.031	-2.82	0.005***
Extension contact (1 = yes)	-0.069	0.05	-1.36	0.173
Constant	0.0743	0.024	-7.95	0
N	2295			
Prob > chi2	0.0000			
R2	0.2095			

Source: SPIDA survey, 2017.

Note: Level of significance: \*\*\*1%, \*\*5%, \*10%.

participation, household head's involvement in local institutions, remittances and distance to the market were statistically significant at the 5 percent level. Also, literacy was found to be statistically significant at the 10 percent level. Before fitting the regression model, endogeneity, multicollinearity, and standard tests were conducted<sup>4</sup>. These tests indicate the absence of severe econometric problem which would lead to biased estimation. In any case, we employed robust standard errors and corrected for heteroscedasticity.

In this type of regression, one might anticipate statistical problems, perhaps due to the possibility of the explanatory variables being related to each other. For instance, those households with large herds might be the same ones accessing credit. This might result in inaccurate or biased estimates for the coefficients). Poor families differ from the non-poor in several ways including the socio-economic characteristics, program participation, institutional participation, and other factors. The determinants which are found to be significant are treated in three sections below.

##### 4.3.1. Household variables

There are two variables: sex of household head and family size. They were statistically significant in the incidence of poverty in the pastoral and agro-pastoral communities. The coefficient associated with gender has the expected sign and is substantial. Compared to female-headed households, the odds ratio for the male-headed households, the likelihood of being poor was reduced by 0.06. Given that other variables are constant; this might be explained by the fact that male-headed households have a better capacity to allocate their available resources in such a way as to obtain more calories per capita than their counterpart female-headed households. Moreover, male-headed households might have alternative income sources and resource entitlements than female-headed households. The result is consistent with the work of Alemayoh, Shimeles, and Zerfu (2008), Etim and Patrick (2010) and Mohammed (2012).

Family size affects the incidence of poverty positively and remains significant at the 1 percent level of significance. A one unit increase in family size increases the odds-ratio (likelihood) of being impoverished by 0.077. The likely explanation is that as family size increases demand for household food increases, with limited opportunity for off-pastoral employment opportunities in the region. This finding is also in line with the empirical results of Hassan and Babu (1991), Bigsten, Bereket, Abebe, and Mekonnen (1999), Dercon (1999), MoFED (2002) and Oduro and Aryee (2003).

One dimension of poverty is education, particularly when poverty is defined to include a shortage of capability and knowledge deprivation. The coefficient associated with literacy was found to be negative and significant, which means that literate household heads are less likely to be poor than are illiterate households. Having a scholarly household head modestly reduces the likelihood of a family he being poor, with an odds ratio of 0.039. An explanation for this is that education might increase earning potential and improve the occupational and geographic mobility of labor.

<sup>4</sup> Likelihood-ratio test of Insigma2=0: chi2(22) = 44.25 Prob > chi2 = 0.1949 and

#### 4.3.2. Community level factors

There are community-level variables that can affect the probability of being poor and the magnitude of this poverty in the pastoral and agro-pastoral communities. The likelihood of being poor depends on whether the household participates in the productive safety net program. The regression result from the logistic model revealed that households' participation in the PSNP helps to reduce the probability of being poor. The odds ratio shows that when involved in the PSNP, the odds ratio of a household being poor declined by a factor of 0.04, other things being constant. This might be because PSNP beneficiaries were getting the opportunity to raise their consumption through their participation in public works or the receipt of direct support during times when their households were exposed to food shortages.

The seasonal or continuous transhumant mobility of households also affects the livelihoods of the families in various ways. While it enables pastoralists to maintain their herds, it has made the introduction of household-based interventions more complicated and challenging. As a result, mobile households are more likely to be poor than non-mobile communities, and the odds ratio of being poor for mobile communities is 0.077. An important factor here is that mobile households are households that might not receive support under the PSNP, precisely because of their mobility. The access of mobile pastoral communities to both components of the PSNP is significantly constrained, even when such households are in a food crisis and in need of such support. Their situation might well be made worse because these households are situated far from markets market, social services, and other services that could enhance their welfare.

Household members' participation in non-pastoral and farm activities also affects the incidence of poverty in the study area. A person's participation in such employment reduces the odds of being poor, with a negative odds ratio of 0.177. This variable is found to be strong and statistically significant in determining poverty in pastoral communities. Household members' participation in an income generating activity helps the household to increase consumption.

Lack of finance is amongst the significant bottlenecks that constrain the pastoral people from undertaking productive investment and increasing the productivity of existing activities or establishing profitable new economic operations. Access to and utilization of credit is expected to provide better chances of getting involved in non-pastoral activities, as a result of which households might increase or diversify their incomes and escape from poverty. It is undeniable that credit access facilitates households' ability to participate in business activities and can also support their consumption when they face a food shortage. Thus, in our study, we found that households who have access to such services and get involved were reducing the probability of being impoverished by the odds ratio of 0.088.

Households' participation in local institutional arrangements, religious, cultural and social, also facilitated a reduction in poverty. These arrangements are existing in the form of clan or family association, cooperatives, 'Edir', 'Zekat' collections and other networks which serve the community when members faced problems, economical, social and political. As these informal social, institutional arrangements are a very crucial source of cooperation, both in cash and kind, among the households during the time of crisis and difficulties; it affects the consumption level of the families. These social arrangements can be visible and practiced through networks, clan arrangements, and cultural and religious ties. In this study, participation in local institutions helps households to reduce the level of poverty through the challenges affecting the consumption level of households. Generally, participation in local institutions reduces the odds of being poor, with an odds ratio of 0.056; it is a statistically significant variable in determining household poverty at 5 percent level of significance. Beyond the direct food and non-food supports these members get from their local institutions, this might happen because households increase their awareness about economic possibilities, or enhance their skills to turn opportunities into benefits for the household, or because they can share experiences and learn during their institutional meetings. Moreover, participation might

help to develop common understandings and provide access to local sources of support or risk sharing mechanisms for household members facing crises or unfavorable situations. All of these help households to maintain or increase consumption.

#### 4.3.3. Spatial variables

Geographic variables also influence the incidence of poverty. The disparities across districts and difference in proximity to the strategic market centers and the most important social services are determining factors in the incidence of poverty in the pastoral and agro-pastoral communities of Zone 1 and Zone 2. In comparison to Aba'la district, Mile, Chifra and Berhale districts are less likely to be poor while Koneba district is more likely to be poor, or more accurately the odds of being poor are greater. This might be associated with the particular nature of the district, and with various factors that can enhance people's livelihoods and improve the productivity of households. The main factors here are the infrastructural arrangements, the particular economic activities of the district and the accessibility of different utilities and services. The proximity of pastoral and agro-pastoral areas to (physical) market centers has been found to provide pastoral people with better access to (economic) markets and thereby contribute to lowering households' likelihood of falling into poverty (Bigsten et al., 1999). In our study, the coefficient for the variable "distance to market" was found to be negative and significant at the 5 percent level. All other things being constant, a kilometer increase in market distance from the pastoral and agro-pastoral household residence, the odds of falling into poverty tends to increase by a factor of 0.011. (Again, this is a reasonably modest association). The likely explanation for this is that the nearer the household is to marketplaces and relatively large towns, the better the access to markets (enabling people) and to public services, as well as to private service providers, and hence the lower the chance of falling into poverty. This is because proximity to significant markets provides better opportunities to buy food items and sell pastoral products, with the opportunity to buy and sell a broader range of goods at more favorable prices, helping to reduce transaction costs and enhance households' chances of using the amenities that the market provides. This finding is paralleled in the work of Bigsten et al. (1999) and Kebede, Shimeles, and Tadesse (2005).

#### 4.4. Households' sources of income and income inequality

##### 4.4.1. Sources of income for households

Based on the nature of their livelihoods, the accessibility of various economic opportunities and the particular interests, preference and capabilities of people in the pastoral and agro-pastoral communities, households depend on different sources of income. We found that households participate in a range of types of employment or activities to generate income and maintain themselves. Households' choices of additional activities depend mainly on their way of life, pastoral or agro-pastoral, with livestock keeping as the mainstay for many. Thus, households in the study area undertake pastoral activities (43.62%) as their primary activity, followed by agricultural work (29.24%), domestic activities (8.76%), employment of different forms (7.71%), daily labor (3.22%) and various retail or trade activities (2.61%).

According to Table 7, 65.45 percent of the households do not have extra jobs to improve their monthly or yearly income. They depend on their primary activity as the principal source of their households' income, even though many would like or are looking for additional jobs. Only 34.55 percent of families who are participating in other alternative income generating activities, which might change from time to time, and the nature of the work and with the season, gender and age of household head or member. 19.61 percent of households had handicrafts as their supplementary activity to generate income, followed by trading activity of various forms (3.53%) and involvement in pastoral work (3.97%).

As the income of the household is directly related to the type of work that the family is involved in and the (relative) returns from that

**Table 7**  
Households' main and supplementary employment.

List of activities	Main activity		Supplementary activity	
	Freq.	Percentage	Freq.	Percentage
Pastoral	1001	43.62	91	3.97
Agro-pastoral	671	29.24	18	0.78
Housewife	201	8.76	46	2
Daily labor	74	3.22	32	1.39
Skilled labor	9	0.39	3	0.13
Animal trading	12	0.52	2	0.09
Retail trade	60	2.61	81	3.53
Handicrafts	6	0.26	450	19.6
Employee	177	7.71	2	0.09
Tailor	2	0.09	2	0.09
Student	29	1.26	23	1.0
Shepherd/herder	3	0.13	26	1.13
Armed (police, soldier ...)	3	0.13	1	0.04
Maid	3	0.13	15	0.65%
Retired	1	0.04	–	–
Unemployed	43	1.87	1502	65.45
Other	–	–	1	0.04
Total	2295	100	2295	100

Source: SPIDA survey, 2017.

work, the highest share of income will be received by those in the sectors with the highest percentage of participation and rate of pay or returns. Income, here, refers to the monthly and /or yearly cash and non-cash (crops), valued at the current price that the household, generated from alternative sources. The dominant share of monthly income of the households came from the agricultural sector (33.82%), followed by the sale of livestock (29.67%), non-farm or non-pastoral work (9.57%), the sale of animal products (7.07%), the productive safety net program (5.16%) and participating in trading activities (4.28%).

Support from family and relatives also constituted 3.62 percent of households' income. Seasonal and permanent employment of household members in different sectors of the local economy made up 2.95 percent of the income of households. Aid from NGOs, government, and support given by local communities together provided 3.58 percent of the monthly income of households. But, more than 60 percent of the yearly income of the families generated from three fairly "traditional" employment categories.

The highest share of the annual income of households came from the sale of livestock (32.45%), followed by the revenue from the agriculture (22.99%) and the sale of animal products like butter, butter, hides, and skins, as well as honey (9.7%).

The income households got from their participation in the Productive Safety Net Program makes up an 8.3 percent share of the yearly income of households in the study area – a substantial percentage.

As stated above and clearly shown in Fig. 6, there are significant differences between the dominant sources of monthly versus annual income. The highest yearly revenue comes from the sale of livestock, while the most upper monthly income comes from agriculture. This might be since the former includes all transitions carried out over the whole year of the study period, whereas the monthly income estimates focused only on the month when the data was collected. Or else the data might indicate the continued centrality of pastoral livelihoods and incomes. Whatever the case, there is a high degree of "lumpiness" in both of these income sources, with sales coming at particular times of the year, rather than steadily through the year. This poses challenges concerning consumption smoothing throughout the year.

Thus, from all sources of income, Table 8, the mean monthly income of households is Birr 1408.98. The split is as follows: agricultural sector (Birr 476.57), the sale of livestock (Birr 418.06), non-farm/pastoral income (Birr 134.9) and the sale of animal products (Birr 99.65). Households have a mean yearly income of Birr 11,203.9, and the mean income deviation is Birr 72,291.04. The maximum income difference

**Table 8**  
Households' Average monthly and yearly income (Birr/household).

Type of income source	Monthly Income (Birr)	Mean Yearly Income (Birr)
Sale of Livestock	418.06	3635.05
Sale of animal products	99.65	1086.53
Employment	41.59	552.27
Agricultural	476.57	2576.09
Trade	60.37	788.8
PSNP	72.71	935.68
Non-pastoral/farm	134.9	547.07
Remittances	50.9	689.66
Aid (NGOs, government)	22.1	307.75
Social support (Community)	17.1	72.58
Others	15.05	11.48
Total	<b>1408.98</b>	<b>11,203.9</b>

Source: SPIDA survey, 2017.

between the families is as follows: from the sale of the livestock (Birr 3635.05), farm income (Birr 2576.09), the sale of animal products (Birr 1086.53), income from participating in PSNP (Birr 935.68) and income from trade (Birr 788.8). These are the five most essential sources contributing to the yearly income of households.

#### 4.4.2. Income inequality

Ensuring equitable distribution of income among families has been seen as critically important by many LDC governments. Poverty reduction efforts are even more worthwhile if they have the power to address income inequality and bring the about fairer distribution of income in which welfare of the society as a whole is maintained. As the income sources of households and the amounts they receive by activity or per specified period differ, income inequality, as measured by the Gini coefficient, will certainly not be perfectly even and will be different from the level indicated by the equal distribution line.

Income inequality in the study area was analyzed using the commonly used, established measure of income inequality, the Gini coefficient.

As depicted in Fig. 7, the income inequality in the study area is 0.592. This general Gini index is evidence of the existence of a high level of variation among households. There was no significant difference in the Gini index across the two study zones (Zone 1 and Zone2 of the Afar region). Families in Zone 1 had an inequality level of 0.588, and Zone 2 had somewhat higher Gini index of 0.599.

In this study, we found a relatively lower Gini index, compared to other districts, in Koneba district (0.433), followed by Mile (0.56) and Aba'la district (0.57). The highest income inequality (0.618) was found in Berahle district, followed by Chifra district within the index of 0.581.

Except for Koneba district, with a Gini index below the level of fifty percent, all the districts have a Gini index of more than fifty percent, which is recognized as indicating an unfair distribution of income. In spite of the highest incidence of poverty, Koneba district is characterized by a relatively lower Gini index. And this more even distribution of income might reduce the complexity of implementing poverty reduction interventions in the district, not least by simplifying targeting.

Even though our study showed the existence of high-income inequality in the study area, we did not find significant differences in the index among or between the households based on some household level and community level variables. However, there was one exception to this. As indicated in Fig. 8, widowed families were characterized by a high level of poverty and also suffered from a high level of income inequality (0.616).

## 5. Conclusions

Social protection practices like the productive safety net program have a positive impact on improving consumption and income of the pastoral and agro-pastoral communities of the Afar region. A high incidence of poverty and an alarming degree of income inequality are the features of

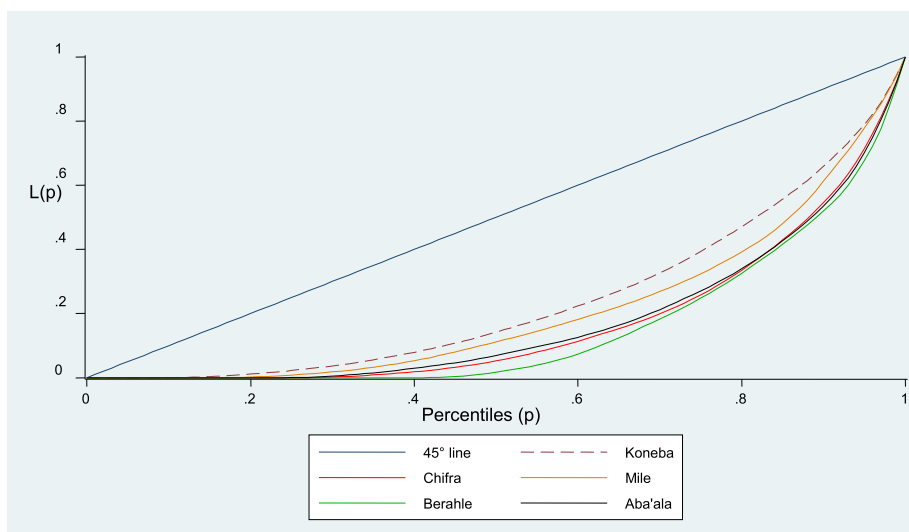


Fig. 7. Lorenz curves by districts. Source: SPIDA survey, 2017.

households in the pastoral and agro-pastoral communities. 47.6 percent of households are living below the poverty line (Birr 389) with a poverty gap index of 0.178 and a poverty severity index of 0.092. So poverty is not only widespread, but also profound. Food-poor households constitute 33.7 percent of the households, and these are situated 11.4 percent below the food poverty line, with a squared poverty severity index of 0.054. There is a high incidence of poverty in the pastoralist communities (35.6%), and 38.5 percent of the mobile pastoralists have higher food poverty compared with non-mobile households. 35.6 percent of Productive Safety Net Program non-participant households and 32 percent of the participant households are living below the food poverty line. Households with married household heads are characterized by a high level of poverty (0.434), stemming from their large family sizes. Female-headed households have a significantly higher poverty level (0.372), relative to male-headed households. The gender of the head of the household; family size; the presence of remittances; the educational level of household head; participation in the social protection program (PSNP); involvement in local institutions; distance to market centers; the number of household members participating in alternative employment and income generation; geographic location; and

access to credit services are determining poverty in Afar.

The pastoral and agro-pastoral households are engaged in three significant occupations or economic activities, providing the bulk of their incomes: pastoral incomes (43.62%), agro-pastoral incomes (29.24%) and domestic work (8.76%). The mean monthly income of households is Birr 1408.98, and the annual income of households is Birr 11,203.9. There is a startling level of income inequality in the study area, with a Gini coefficient of 0.592 for the area as a whole which varied across location, marital status, and by some community variables.

To address the widespread poverty and unfair distribution of income, policies, and programs should place greater emphasis on serving youth and female-headed households. Promote a culture of saving and motivating households to participate in off-pastoral activities. Strengthening the functioning and scope of the local institutional arrangements and supporting them to be more productive. It is worth considering if development interventions could integrate pastoral areas more closely into the wider economy, with rural community roads to marketplaces. Microfinance products tailored for pastoral communities and suitable for Muslims should be introduced to raise productivity and

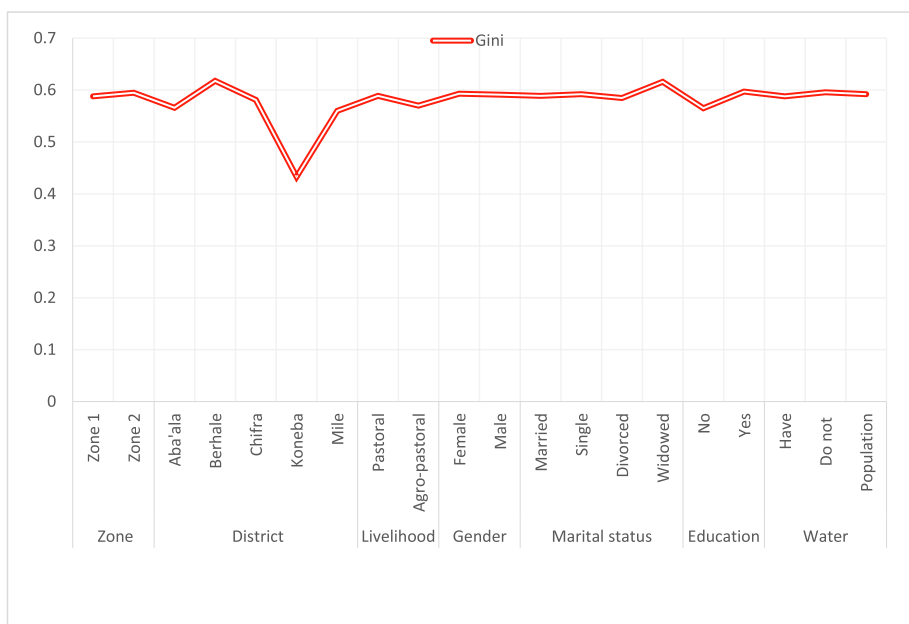


Fig. 8. Gini index by household, community level, and geographic variables. Source: SPIDA survey, 2017.

support households to diversify their employment.

### Declaration of Competing Interest

The author(s) here declared that there is no conflict of interest related to this paper.

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### Appendix

See [Tables A1–A5](#).

**Table A1**  
Food items used to estimate the poverty line.

Food item	Kg/month/AE	Kcal/100 g	kcal/month/AE	kcal/AE/day	Share (%)	Average price	Food expenses
Wheat	4.82	351	16918.2	563.94	25.63	14.5	69.89
Maize	7.1	362	25,702	856.73	38.94	11	78.1
Barley	1.6	354	5664	188.8	8.582	10.5	16.8
Sorghum	2.9	380	11,020	367.33	16.7	10	29
Onion	0.11	42	46.2	1.54	0.07	30	3.3
Red paper	0.18	15	27	0.9	0.041	130	23.4
Meat	0.16	143	228.8	7.6267	0.347	90	14.4
Butter	0.135	736	993.6	33.12	1.505	140	18.9
Sugar	0.2	400	800	26.667	1.212	30	6
Milk	3.9	79	3081	102.7	4.668	6	23.4
Oil	0.172	884	1520.48	50.683	2.304	35	6.02
	16.457	3746	66001.28	2200	100		<b>289.21</b>

Source: SPIDA survey, 2017.

**Table A2**  
Income inequality (Gini index) by district, household, and community level features.

Group	Estimate	STD	LB	UB
<i>Zone</i>				
Zone 1	0.588	0.01	0.569	0.607
Zone 2	0.595	0.01	0.574	0.615
<i>District</i>				
Aba'ala	0.566	0.017	0.533	0.599
Berhale	0.618	0.013	0.592	0.643
Chifra	0.581	0.013	0.555	0.607
Koneba	0.433	0.03	0.374	0.492
Mile	0.560	0.013	0.534	0.586
<i>Livelihood</i>				
Pastoral	0.589	0.008	0.573	0.605
Agro-pastoral	0.57	0.016	0.539	0.602
<i>Gender</i>				
Female	0.593	0.013	0.567	0.619
Male	0.591	0.008	0.578	0.608
<i>Marital status</i>				
Married	0.589	0.008	0.574	0.605
Single	0.592	0.029	0.535	0.649
Divorced	0.585	0.029	0.528	0.641
Widowed	0.616	0.029	0.559	0.673
<i>Access to education services</i>				
No	0.565	0.019	0.529	0.601
Yes	0.597	0.008	0.582	0.612
<i>Access to safe drinking water</i>				
Yes	0.588	0.01	0.568	0.607
No	0.596	0.01	0.576	0.616
<b>Population</b>	<b>0.592</b>	<b>0.007</b>	<b>0.578</b>	<b>0.606</b>

Source: SPIDA survey, 2017.

**Table A3**  
Description of variables and their expected signs used in the regression model.

Variables	Mean (Dummy = 1)	Description of the variables
Age of household head	36.1	A continuous variable equal to the age of the head of the household
Sex of household head	69.02	Dummy variable which takes the value of 1 if the household head is male and 0 if female
Remittances	23.83	Dummy variable 1 if the household gets remittances from family or relatives and 0 otherwise
Family size	5.94	Refers to the number of household members living under the same roof for the last six months
Marital status	71.29	Dummy variable 1 if the household head is married and 0 otherwise
Literacy	81.09	Dummy variable 1 if the household head is literate/ can read and write and 0 otherwise
Local institutions	58.7	Dummy variable 1 if the household head participates in local institutional arrangements both religious and non-religious aiming at supports and cooperation, 0 otherwise
Health access	76.95	Dummy variable 1 if the household has health service access and 0 otherwise
Experience of shocks (1 = yes)	22.53	Death of a family member is taken as a proxy for the experience of shocks. Dummy variable 1 if the household has experienced the death of head or spouse and 0 otherwise
Mobility (1 = yes)	54.07	Dummy variable 1 if the household practices transhumant mobility and 0 otherwise
PSNP (1 = yes)	51.37	Dummy variable 1 if the household is PSNP beneficiary and 0 otherwise
Livelihood (1 = agro-pastoralist)	33.29	Dummy variable 1 if the livelihood system is agro-pastoral and 0 otherwise
Non-pastoral/farm employment	49.50	Refers to the number of household members participating in non-pastoral/farm employment
Distance to market	52.4	Refers to the total distance to market in kilometers
District	–	A categorical variable with five districts, expecting that poverty differs by geographical location
Tropical livestock unit (TLU)	103.58	Refers to the total number of livestock owned by the household in TLU
Credit utilization (1 = yes)	2.53	Dummy variable 1 if the household head has taken a loan from a financial institution, NGOs, local units or government agency and 0 otherwise
Extension contact	Negative	Dummy variable assuming 1 if the household head gets extension services and 0 otherwise

Source: SPIDA survey, 2017.

**Table A4**  
Sample size by district, village and livelihood systems.

Zone	District	Village	Freq.	Percent	Livelihood system
Zone 2	Aba'la	Gelaeso	121	5.27	Pastoral
		Hidmo	153	6.67	Agro-Pastoral
		Gube	97	4.23	Pastoral
	Berhale	Sabana-Demale	182	7.93	Agro-Pastoral
		Bure	175	7.63	Pastoral
		Daar	200	8.71	Pastoral
	Koneba	Elhena	201	8.76	Pastoral
			Koneba	87	3.79
		Wahdes	77	3.36	Agro-Pastoral
			Gerero	126	5.49
	Chifra	Mesgid	145	6.32	Agro-Pastoral
			Taeboy	132	5.75
Zone 1		Mile	Bekelidaar	179	7.8
	Geseyonaleas		207	9.02	Agro-Pastoral
	Harsis		213	9.28	Pastoral
	Total		2295	100	

Source: SPIDA survey, 2017.

**Table A5**  
Adult Equivalence Scale.

Years of Age	Sex	
	Male	Female
0–1	0.33	0.33
1–2	0.46	0.46
2–3	0.54	0.54
3–5	0.62	0.62
5–7	0.74	0.7
7–10	0.84	0.72
10–12	0.88	0.78
12–14	0.96	0.84
14–16	1.06	0.86
16–18	1.14	0.86
18–30	1.04	0.8
30–60	1.00	0.82
60 plus	0.84	0.74

Source: Dercon and Krishnan (1996).

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