Rural Households Poverty in the Northern Amhara, Ethiopia: Evidences from Gubalafto Woreda

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Abstract

Over a decade, the food poverty persistently increase in Amhara region in which Gubalafto Woreda is located, and the rural population in Gubalafto Woreda has suffered from a successive food deficit and famine. Annually, the survival of around 35 percent of the total population depends on emergency relief food aid in the last two-consecutive years. As results, large numbers of people were being under poverty. The study was set out to examine the extent and determinants of poverty, poverty gap, and poverty gap square, and to measure the income inequality in the study area. Primary data was used from the stratified random sample of 250 households drawn from three agroecological zones to achieve our objectives using cross-sectional observation. Using the Cost of Basic Needs approach, total poverty line of the study area is Birr 294.6 per month per adult. Accordingly, 30.8 & 37.42 percent of sample household were unable to deserve their basic needs at a current time, and being under poverty at a period ahead. The OLS, and Tobit analytical models used to identify the determinants of welfare, poverty gap and poverty severity. Consequently, family size, participation on wage employment, distance to the main market and kolla agroecological dummy affect welfare status negatively and significantly. But they affect poverty gap and poverty severity positively. On the other hand, oxen, land size, non-livestock asset, participation on own business, access to credit and access to extension service affects the welfare status positively and significantly, however they affect poverty gap and poverty severity negatively. In conclusion, rural household poverty closely coincided with household characteristics, asset holding, infrastructural facilities, and institutional services. In spite of many efforts to mitigate poverty in the past, 43.2 percent of the total population was dependent on emergency relief food aid in the last twelve months.

Keywords: Poverty, determinants, Rural Household, Northern Amhara, Ethiopia.

1.   INTRODUCTION

Over the last three decades, widespread poverty has prevailed in many Sub-Saharan African countries of which Ethiopia is the most affected one. Hence, Ethiopian government has carried out far-reaching institutional and policy reforms to achieve sustainable development. As a result, since 2007, Ethiopia has achieved strong and rapid economic growth, which is undoubtedly making the country as one of the highest performing economies in the sub-Saharan Africa. However, still now it remains one of the world's poorest countries. With considering the incidence and rural-urban poverty distribution, around 29 per cent of the population lives below the national poverty line (which is 3,781 Birr per adult person per year), 30.4 per cent of poor people live in rural area as compared to 25.7 per cent of urban poor. In addition, Ethiopia also ranks 174th out of 187 countries on the United Nations Development Programme's human development index, and average per capita incomes are considerably less than half of the current sub-Saharan average (UNDP, 2011). The Ethiopian government has introduced agricultural development lead industrialization policy as its main policy program accompanied with many poor targeting interventions to achieve sustainable economic growth and reduce poverty, and government has been constantly pursuing development efforts in addressing mainly rural poverty.

Demeke et al. (2003) examined the extents and determinants of poverty in rural Ethiopia using 1999/2000 rural household income and expenditure survey data under the works of growth, employment, poverty and policies in Ethiopia. The study reveals in details that demographic characteristics, asset holding and education level significantly associated with household consumption expenditure although the study limited on the current poverty status. Tsehay and Bauer (2012) examine the dynamics and determinants of rural household poverty and vulnerability in the Northern highlands of Ethiopia using Ethiopian household survey data 1994-2010. They found that in the panel period, poverty indices significantly varies over time and across the districts that it shows different causes may account for the household either being poor or not, including Landholding, access to credit and agricultural extension services , family size. However, this study did not included infrastructural and environmental variables comprehensively.

A study on poverty and its determinants among smallholder farmers in the eastern harangue highlands of Ethiopia by Bogale and Korf (2009), revealed that household composition in terms of (size per adult equivalent & dependency ration), access to irrigation and off-farm income significantly improves the household consumption expenditure and strongly correlated with lower probability of being poor. Similarly, with the previous study, the impact of infrastructural and environmental factor was not displayed in the analysis of poverty and vulnerability to poverty.

This paper intended to fill part of the gap by providing depth and comprehensive investigation on poverty and its determinants in one of the regions of Ethiopia, Amhara taking evidences from Gubalafto woreda. Moreover, there were many evidences that shows, large number of rural households were being under poverty and being in poverty over a period ahead.

Firstly, even if, the total as well as food poverty decline in all regions over the past five years, food poverty increases from 32.5% in 1999/00 to 38.8% in 2004/5 to 42.6% in 2010/11 consecutively in unexpected manner in Amhara region where Gubalafto Woreda is found (MOFED, 2012). Therefore, increasing large number of people unable to meet their basic needs from time to time.

Secondly, the rural population in Gubalafto Woreda has suffered from a successive food deficit and famine. To this end, as the PSNP implementation plan document of (MoARD, 2009) describes a total of 51,775 people (37% of the Woreda population) targeted to supply 3261.825 MT of food transfers in the year's period 2010-2014.

Lastly, according to the office of North Wollo food security and disaster prevention and preparedness report 2012, various interventions had been undertaken to strengthen the grassroots economy, as well as to improve the wellbeing of the household's living standard in all Woredas. However, the rural household emergency relief food aid dependents took the highest and stayed at a higher-level in the study area for the last five consecutive years as compared to other Woredas. Annually, around 35 percent of the total population was dependent on food aid in the last two years on average in the study area. It makes that the area had been the highest food aid recipient woreda in the region. Therefore, this study attempt to come up the solutions for the above mentioned problems in addition to fill the gap that exists in the literature.

1.1.   Objectives of the study

The overall objective of this research is to analyze poverty and its major determinants in the study area. As part of the general objective, this research work intends to achieve the following specific objectives as well:

➢ To measure the extents, depth and severity of poverty in the study area

➢ To identify the major determinants of welfare (consumption as a proxy), poverty gap and poverty severity

➢ To measure the welfare (consumption expenditure) inequality in the study area

2.   METHODOLOGY

2.1.   Description of study area and the data sources

The study conducted at Gubalafto worda, which found in the Northern part of the Amhara national regional state (ANRS), Ethiopia. Gubalafto Woreda has three agroecologocal zones, lowland (kolla) that ranges from 1500-1800, mid-altitude (Weynadega) ranges from 1900-2200 and highland (Dega) ranges 2300-3300masl (WAO, 2012). Agroecological distribution of the study area accounts 17% of Kolla, 37% of Dega and 46% of Weynadega. According to Gubalafto woreda Environmental Protection, Land Administration and Use Office, most of the land is mountainous and characterized by steep slopes, unsuitable for agricultural purpose thus; the cultivated land is limited only to 36.59% of total land area, which is followed by 21.3% of degraded area out of 98,687.5 hectares of the total land size. The average land holding size for a household is 0.78 hectare, which is ranging from 0.4 hectare in the highland areas to the 1.93 hectare in the lowland areas of the Woreda. The study area is highly prone to frequent shortage of rainfall and receives an annual rainfall ranging between 300-400 mm on average. Households subsidize their consumption expenses by selling animals, which means that livestock ownership is an important for livelihood in the study area (Mohammed, 2010). The study aims to measure the extents, depth and severity of poverty as well as to identify the major determinants of welfare, poverty gap and poverty severity. To assure the stated objectives, the study used mainly primary data collected from a household survey in the study area. Structured questionnaire was used to collect information on household demographic composition, consumption expenditure (food and non-food expenditure), income, physical capital variables of household including livestock holding, human capital variable, etc. In general, multipurpose questionnaire was used to collect the required data. The data collection process was held through a personal interview with the households on March 2013. The study also included secondary data from the Woreda (WoFED), Zonal food security and disaster prevention and preparedness office, and woreda agricultural office.

2.2.   Sampling Techniques

A mix of stratified, proportionate and systematic random sampling techniques was followed, which involves mainly two-step procedure. Gubalafto woreda has 34 Kebeles with three agro-ecological zones: lowland (Kolla), mid-altitude (Weynadega) and highland (Dega). Thus, in order to get representative sample household, first the total number of Kebeles stratified into three agroecologocal zones such as Dega, Weynadega and Kola. Based on the proportionate number of Kebeles in each agroecologocal zone, six Kebeles selected randomly. Second, the sample size from the randomly selected Kebeles was determined based on the population size of the Kebeles. In

this study, households are the major units of analysis. Then, sample household for the survey in each selected kebels was based on systematic random sampling methods, which is sampling draw of every n^{th} element from a list (obtained from each Kebele's administrative office). Sample size determination takes into account both availability of limited resources and number of explanatory variables used in the econometric model regression. In general, the household survey conducted with 250 households.

2.3.   Poverty Lin

Poverty assessments involve the choice of a welfare measure, (a) poverty line(s) and selection of poverty indices to enable aggregation of poverty.

In the welfare measurements, the most important issue is the choice of using whether individual income or consumption expenditure as welfare indicators. Consumption expenditure is preferred over income because the latter is volatile while households are assumed to seek stable levels of welfare over time (Ravallion, 1994). According to Lipton and Ravallion (1993) in the most developing countries, consumption rather than income have been preferred as a measure of welfare indicators. This is because first current consumption provides information about incomes at other dates; it might be for the past or future. Hence, it considered as a good indicator of long-term average well-being. Second, income treated as a measure of welfare opportunity while consumption on the other hand considered as a measure of welfare achievements by households. Focusing on the realized instead of potential welfare is relevant. Third, it is regular that consumption fluctuates less than income, due to households or individuals smoothing their consumption. Households' not only financed their current consumption but also they responds to fluctuation in income by saving in the boom periods and dis-saving during lean periods in order to smooth their consumption. Considering both the purchased and the imputed value of auto-consumption the standardized welfare indicator computed by scale up household consumption expenditure by adult equivalent household size using standards adopted from WHO (1985). We used the cost of basic needs (CBN) approaches in estimating the poverty line among the other methods. In this approach, first order ascendingly the households according to the consumption expenditure and the poorest 50% of the sample population identified as a reference group by presuming more than 50 percent of households falling under poverty in the study area. The food consumption behavior of the reference group also accessed to determine average quantities per adult equivalent of basic food items that make up the reference food basket. Here, the basket is made up of the mean consumption levels of 23 food items consumed by the poorest 50 percent of the population in adult equivalent terms.

Second, the total calorie obtained from the consumption of average quantity per adult estimated based on the caloric content of food items of each of the 23 food items. The average quantity per adult of each food item is scaled up and down by a constant value (ration of recommended calorie of per day per adult to the total calorie obtained by individual adult from consuming the average quantities) so as to provide the recommended calorie per adult per day. Third, total food poverty line computed by multiplied each food item by the median price and sum up. Consequently, the necessary allowance for the basic non-food item was made to get a non-food poverty line and finally the total poverty line obtained by the sum of food and non-food poverty line. Following Ravallion and Bidani (1994), we estimated the non-food component of the poverty line by examining the consumption behavior of those households who can just afford the reference food basket.

FGT (Foster Greer, Thorbecke (1984) group of poverty measure indices become the most popular class of poverty indices that meet fundamental axiomatic requirements of such poverty indexes mainly consistency and additive decomposability as compared to other poverty measure indices developed by (Sen, 1976; Foster, 1984; Foster and Shorrocks, 1984).

The FGT poverty measure is specified as:

$$P_\alpha = \frac{1}{N} \sum_{h=1}^{q} \left[\frac{Z - Ch}{Z} \right]^\alpha$$

(1)

Where, Z is the poverty line, q is the number of households below the poverty line, N refers to the number of households in the reference population/total sampled population, denotes Per adult equivalent consumption expenditure of household h below the poverty line in time period t. The parameter $\boldsymbol{\alpha}$ is a nonnegative parameter indicating the degree of sensitivity of the poverty measure to inequality among the poor. It is known as poverty aversion parameter.

2.4.   Econometric model specification
2.4.1.   Determinants of Consumption Expenditure

The investigation of poverty will not be inclusive without explaining why people are poor and remain poor over time. At micro level, there are the two most widely used methods to model the determinants of poverty in the literatures. One, poverty determinants assessed by regressing per adult equivalence consumption expenditure against a series of exogenous independent variables. Second, determinants of poverty can also be examined through a probit, or logit regression, where the dependent variable is a binary variable taking the value of one

when the individual is poor, and zero otherwise. However, logit or probit model is strongly criticized by many researchers. Like (Ravallion, 1994; Datt & Jolliffe, 2005; Pudney, 1999; Coudoel et al, 2004; Simler, 2004; Fagernäs et al, 2007; World bank, 2005) all are seriously criticize the construction of an artificial dependent variable, in which information about the actual relationship between the level of consumption and the dependent variable is lost. We used the level regression to model the household welfare. Let the welfare indicator W_i be gives as: $W_i = C_i/Z$.   (2)

Where Z is the poverty line and C_i is the consumption expenditure per adult equivalent.

The functional specification for the determinants of household welfare, in the study area applied a typical regression equation of semi-log linear regression functional form adopted by (Demeke et al, 2003; Hagos and Holden, 2003; Audet et al, 2006; Mariara et al, 2006; Seetha, 2010; Simler et al, 2004) etc specified as follows:

$$LogWi = \beta'X_i + \varepsilon_i$$ (3)

Where $LogWi$ refers the logarithm of the ratio of consumption expenditure per poverty line. The right hand variables in the regressions include (a) household characteristics; (b) farm and non-farm asset; (c) off-farm income participation; (d) human capital variables; (e) access to different institutional services; and (f) covariant and idiosyncratic shocks.

2.4.2.   Determinants of Poverty Gap and Poverty Severity

Information obtained from level regression of consumption expenditure may yield misguided policy recommendations, if the poor and the non-poor present different behavioral patterns and some of the hypothesized determinants of welfare may have different returns for the poor and non-poor. Therefore, in order to model the determinants of poverty gap and poverty severity, following Appleton (1995), a censored Tobit model is applied. The measure of household poverty specified as Pi, is given by:

$$P_i = \left(\frac{Z-C_h}{Z}\right)^{\alpha} \text{ if } C_h < Z \text{ And } P_i = 0 \text{ otherwise}$$ (3)

Where, is equal to 1 and 2, Pi refers to the poverty gap and poverty severity of the household h respectively, Z = poverty line and denotes consumption expenditure of household in adult equivalent. Subsequently, modeling this would be equivalent to modeling a censored dependent variable, equal to the consumption of the poor but the consumption expenditure of the non-poor fixed at the poverty line (see Madalla, 1999).

3.   RESULTS AND DISCUSSION

3.1.1.   Poverty profiles

Based on the cost of basic needs approach the food, non-food and over all poverty line in the study area becomes Birr 233.81, 60.29 and 294.6 respectively. The poverty profiles of the study area summarized in Table 1, and considering the estimated total poverty line, around 30.4 percent of households fall under poverty, and they unable to meet their basic needs. However, Head count index violates the transfer axiom and does not take into account the intensity of poverty. It   does not change when the people below poverty line become poorer and poorer.

Table 1: Poverty profiles

Poverty indexs	Food poverty at current market price	Non-food poverty at current market price	Total poverty at current market price
Head count(P_0)	37.2	25.6	30.4
Poverty gap (P_1)	9.43	6.71	6.46
Poverty gap squared (P_2)	3.23	2.39	2.02

Source: compute from own survey, 2013.

     Poverty gap in the study area is 6.46% in which at least 6.46 % of the poverty line should be transferred to the poor to bring the poor households into the poverty line. Nevertheless, Poverty gap does not take into account the inequality among the poor since the poverty gap index is the mean over all people of the gaps between the welfare of the poor and poverty line. The poverty severity of the study area is being 2.02 that show the inequality among the poor. Based on the food poverty line, 37.2% of household unable deserver their basic food consumption needs. This is consistent and similar to the trends of poverty indices of rural household of Amhara region indicated by MoFED, 2012 report.

3.2.   Poverty Decomposition by Agroecological Zones

The study found that the incidence, the poverty gap and severity of poverty are not the same across the three-agroecological zones (see Table 2). In all poverty indices, the highest proportion of the poor households were found in the kolla agroecological zone (40%), followed by the Dega agroecological zone (38.37%) and the least was in Weina-dega agro ecological zone (23.5%).

Table 2: Poverty Decomposition by Agroecological Zones.

Agroecologocal zones	Head count (P_0)	Poverty gab (P_1)	Poverty gap square (P_2)
Dega	38.37	8.02	2.41
Kolla	40.00	9.24	3.03
Weynadega	23.13	4.83	1.54
Total	30.40	6.46	2.02

Source: compute from own survey, 2013.

3.2.1.   Poverty decomposition by Demographic and socioeconomic characteristics

Poverty decomposition by different demographic and socioeconomic variables enable to answer the question of "who the poor are" in the study area. The researcher used variables like gender of household head, family size, educational level of household head and asset holding (land size, oxen holding, other livestock holding, farm and household assets). Involvement in own business activities, involvement in employment on wage, access to irrigation, access to credit, access to extension service, use of modern inputs, distance to main market, and village level infrastructural facilities also used to decompose the poverty indexes.

As can be seen from Table 3, decomposition by gender does not show significant differences in poverty between male and female-headed households.   Household size on the other side is strongly correlated with poverty measures. Households with large family size larger than the average family size for the whole sample exhibit significantly higher poverty indexs as shown by all poverty indices (head count, poverty gap and poverty gap squared).

Table 3: Socioeconomic Decomposition of Poverty Indexes

Socioeconomic variables		Poverty indexes		
		Head count (P_0)	Poverty gap (P_1)	Poverty severity(P_2)
Sex of household head	Female	0.3077	0.0690	0.0220
	Male	0.3033	0.0637	0.0199
	t-test	-0.0230	-1.0823	-1.1061
Family size	<mean	0.192	0.0414	0.0126
	>=mean	0.416	0.0877	0.0277
	t-test	3.9614***	2.9313***	2.1999**
Number of adult	<mean	0.2177	0.0422	0.0118
	>=mean	0.3889	0.0866	0.0284
	t-test	2.9638***	2.7882***	2.4148**
Household head education	< grade8	0.3100	0.0665	0.0211
	>=grade8	0.2381	0.0431	0.0103
	t-test	-1.3009	-1.9497*	-2.5352**
Oxen holding	< a pair	0.3383	0.0753	0.0241
	>= a pair	0.1633	0.0203	0.0043
	t-test	-4.4669***	-5.4868***	-4.6084***
Tropical livestock unit (TLU)	<mean	0.3355	0.0787	0.0263
	>=mean	0.2551	0.0426	0.0107
	t-test	-1.6650*	-2.7517***	-2.7753***
Land size per timad	< mean	0.3293	0.0596	0.0153
	>= mean	0.2917	0.0670	0.0226
	t-test	-0.4186	0.2981	0.6918
Current asset holding (value)	< mean	0.3696	0.0843	0.0271
	>= mean	0.1212	0.0095	0.0009
	t-test	-6.3133***	-7.0903***	-5.7101***
Current asset index	< mean	0.3759	0.0913	0.0307
	>= mean	0.2222	0.0342	0.0082
	t-test	-2.8436***	-3.8850***	-3.5378***
Irrigation access	No	0.3657	0.0692	0.0200
	Yes	0.2328	0.0592	0.0204
	t-test	-2.4678**	-0.6712	0.0664
Participation on own business activity	No	0.3285	0.0704	0.0224
	Yes	0.1860	0.0362	0.0096
	t-test	-3.5150***	-3.2825***	-2.9835***
Participation on wage activity	No	0.2067	0.0369	0.0094
	Yes	0.4500	0.1060	0.0363
	t-test	5.0331***	5.2521***	4.7392***
Access to credit	No	0.3036	0.0727	0.0243
	Yes	0.3043	0.0579	0.0169
	t-test	0.0119	-0.8288	-0.9642
Access to modern inputs	No	0.3723	0.0802	0.0270
	Yes	0.2628	0.0552	0.0161
	t-test	-2.2840**	-1.1946	-1.9617*
Distance to main market	>=mean	0.3673	0.0781	0.0238
	<mean	0.2632	0.0558	0.0179
	t-test	-1.4028	-1.0915	-0.6723

Source: compute from own survey, 2013.*, ** and *** significant at 10%, 5% and 1% respectively

Results on Table 3 also reveal that households with educated household heads have low level of poverty. In terms of the incidence of poverty, household head educational level does not make any statistically significant difference. However, considering the poverty gap and square poverty gap indexes household heads with having at least primary school complete have low level of poverty than otherwise.

The study indicates that poverty measures and household's asset holding have an inverse relationship in the Gubalafto worda. Households with oxen holding greater than or equal to a pair of oxen have significantly lower level of poverty than households who possess less number of oxen.

Similarly households with livestock holding (excluding ox) greater than or equal to the average for the Woreda displayed significantly the lower poverty measures as compared to the households with livestock

holding less than the average livestock holding of the Woreda.

The households with a land size greater than or equal to the woreda average land size have in effect lower poverty in terms of the incidence of poverty but have higher poverty in terms of the depth and severity of poverty although the difference is not statistically significant. Moreover, the study found that the households having non livestock asset holding greater or equal to the Woreda mean, exhibits significantly lower poverty levels in terms of incidence, poverty gap and poverty severity than those who have asset holding less than the mean.

Irrigated land is the other factor that results in differences in poverty levels. Households with access to irrigation have lower levels of poverty than households without access to irrigation.

Referring to the poverty incidence, poverty gap and poverty severity, households with their own business activities have significantly lower poverty measures than otherwise, and the difference is statistically significant in all poverty measures at 1% significance level. On the other hand, wage employment is positively associated with poverty. Households with involvement on wage employment have significantly higher poverty levels in terms of incidence, depth and severity than other wise.

The incidence of poverty is somewhat higher in the households with having access to formal credit but lower poverty measures in terms of poverty gap and poverty severity, and the difference are not statistically significant. The households those who used modern inputs in the last main production season displayed lower poverty indexes as compared to non-users although the difference is not statistically significant. Poverty is also positively correlated with distance to main market.

3.3.   Econometric Results and Discussions on the Determinants of Household Consumption Expenditure per Adult Equivalent

Referring the multiple regression estimates of the ordinary least square regression (see Table 1.6), gender of household head is positively related to household welfare indicating that male-headed households have higher welfare than female-headed household does although it is not statistically significant. In the rural area, agricultural activities required heavy labor force, and thus the result reflects it. Age and age square, are not statistically significant but it reflects the life cycle hypothesis, which mean that initially as age increase household income increase up to a certain limit and then it decrease as the age of household head increase.

The regression result shows that household size has a negative effect on household consumption expenditure measured by per adult equivalent. It is statistically significant at 1% significance level, and households with a large household size have a lower welfare than the households with having a small number of family size. This inverse relationship between consumption and household size is similar to the finding of (Fredu, 2008, Jan et al, 2008; Andersson et al 2005; Seetha, 2010; Gounder, 2012; Fagernäs and Wallace, 2007). Dependency ration has statistically significant positive effect on the household welfare at 5% significance level. In the area, households with a large number of dependents as compared to the number of adult household members have higher welfare. In another direction, this means that the households with a large number of adults have lower welfare than the households with small number of adults relative to the number of dependents. This might be due to poor functioning of the labor market, small land size (as a source of idle labor) and negative marginal returns to labor in the study area. This is also similar to the study of (Fagernäs and Wallace, 2007).

Considering the asset holding, oxen are the main sources of plowing power in the rural household of Gubalafto worda. Oxen holding, which is measured by number of oxen per adult equivalent household size have a significant and positive effect on the welfare of the households and it is statistically significant at 1% significance level. Similar to the study of (Fredu, 2008; Hagos and Holden, 2003) households with large number of oxen per adult equivalent are less poor than their counterparts. Holding all other things remains constant, adding one additional ox per adult person increase the household welfare by 34.96%. Livestock holding excluding ox is positively associated with household welfare although it is not statistically significant. Land holdings of the households are closely linked to the household's welfare status. Landholding size, which is measured by land size per adult equivalent, has positive and statistically significant effect on the household's welfare. The households with large farm size have higher welfare, which is measured by consumption expenditure per adult equivalent than the households with small farm size. As land size per adult equivalent household unit increase by one timad, household welfare increase by 36.91% with ceteris paribus. This result also supported by the finding of (Datt and Jolliffe, 1997; Hagos and Holden, 2003; Fagernäs and Wallace, 2007; Demeke et al, 2003). In addition to this, non-livestock asset holding (both farm and household asset) is another important asset in the Gubalafto wereda with statistically significant and positive effect on household welfare. As a household's possession of current assets increases, its welfare level too increases implying a lower probability of falling into poverty. This is also similar to the finding of (McGregor and Litchfield, 2008). The coefficient of current asset value is statistically significant at 1% significance level.

Table 4: OLS regression results on the determinants of consumption expenditure per adult equivalent

Explanatory variables	Coefficient	Robust.Std. Err	t-value	p-value
Head male	0.0628	0.0669	0.94	0.349
Head age	0.0052	0.0114	0.46	0.649
Head age square	-0.0001	0.0001	-0.73	0.468
Mean family age	0.0021	0.0019	1.13	0.260
Family size	-0.0868***	0.0241	-3.6	0.000
Dependency ratio	0.1010**	0.0506	2.00	0.047
Number of children, 7-14years	-0.0477	0.0361	-1.32	0.188
Headedu8(>=primary school)	0.0979	0.1137	0.86	0.390
Oxen per adult equivalent hh	0.3496***	0.1148	3.05	0.003
Tlu per adult equivalent hh	0.0953	0.0655	1.46	0.147
Land size per adult equivalent hh	0.3691***	0.0755	4.89	0.000
Current asset value	0.00002***	0.0000	4.71	0.000
Employment on own business	0.1487**	0.0715	2.08	0.039
Employment on wage	-0.1497**	0.0598	-2.50	0.013
Irrigation access	0.0432	0.0668	0.65	0.519
Access to credit	0.0967*	0.0573	1.69	0.093
Access to extension services	0.1639	0.1287	1.27	0.204
Input use	-0.0420	0.0818	-0.51	0.608
Access to aid	-0.0651	0.0505	-1.29	0.199
Village level infrastructural index	0.1139	0.1220	0.93	0.352
Distance to main market	-0.0006***	0.0002	-2.85	0.005
Drought shock	-0.0712	0.0713	-1.00	0.319
Death shock	0.0080	0.0602	0.13	0.895
Dega	-0.0205	0.1121	-0.18	0.855
kola	-0.1696*	0.0919	-1.85	0.066
_cons	0.1120	0.3108	0.36	0.719

Number of obs = 250	F(25, 224) = 12.04	Prob > F = 0.0000
R-squared = 0.5052	Root MSE = .3522	

///*, ** and *** refers to Significant at 10%, 5% and 1% Significant level respectively

Source: Compute from own survey, 2013

Households with off-farm income activates generate additional income directly and they can boost their farming income by using off-farm income as a means of subsidizing their input constraint in the other direction. The study treats the effect of household involvement in off-farm income on household's welfare by separating off-farm income involvement into two components, such as employment on own business and the employment on wage. Employment on own business activity (petty trade and others) has a positive impact on household's welfare, and it is statistically significant at 5% significance level. However, household participation in wage employment has a significantly negative effect on the household's welfare. It means that households engaged in wage employment have lower level of welfare than households not engaged in non-farm or households engaged in own business supporting the popular view that in many developing countries households are forced rather than attracted to enter into non-farm wage employment because of lack of other options. Access to credit is another important variable, which affects the household welfare positively and significantly. The access to credit enables the households to minimize their financial constraints and helps to purchase oxen, fertilizer, improved seeds and other inputs. The coefficient of access to credit is statistically significant at 10% significance level. Holding other things remain constant, household's welfare status increases by 9.67% if the household gets credit access.

Village level infrastructural facilities have a positive effect on welfare even if it is not statistically significant. Access to main market is another village level characteristic, which has significant and negative effect on the household's welfare status. Results indicate that households closer to the main market have higher consumption per adult equivalent than households who live in remote areas far from the market. This is similar to the finding of (Fredu, 2008). The coefficient of the agroecological dummy has significantly negative impact on welfare, and the households living in the Kolla agroecological zone have a lower welfare status as compared to the households who lives in the Weynadega agroecological zone. The estimated coefficient is statistically significant at 5% significance level.

3.4.   Econometric Results on the Determinants of Poverty Gap

The Tobit estimation result on the determinants of poverty gap (Table 5) confirmed that the mean household age has a significant and negative relationship with the poverty depth, implying that households with younger family members have higher poverty depth. This is due to the reason that, as age increase the households would accumulate more assets; consequently, it reduces the intensity of poverty gap and probability to fall under the poverty gap. The coefficient of household size is statistically significant and positively correlated with the probability of falling into poverty gap. Considering the marginal effect of estimated coefficient, household's

probability to falling into the poverty gap increase by 3.79% if the household size increase by one member

Table 5: Determinants of poverty gap (Tobit model)

Explanatory variables	Coefficient	dy/dx	Robust.Std. Err	t-value	p-value
Head male	0.1050	0.0273	0.1803	0.58	0.561
Head age	0.0148	0.0041	0.0393	0.38	0.707
Head age square	0.00003	0.00001	0.0004	0.08	0.937
Mean family age	-0.0174*	-0.0048	0.0090	-1.93	0.055
Family size	0.1379**	0.0379	0.0666	2.07	0.040
Dependency ratio	-0.1741	-0.0478	0.1469	-1.18	0.237
Number of children (7-14 years)	0.1410	0.0387	0.1041	1.35	0.177
Headedu8(>=primary school)	0.3712	0.1254	0.3438	1.08	0.281
Oxen per adult equivalent hh	-1.6239***	-0.4460	0.4835	-3.36	0.001
Tlu per adult equivalent hh	-0.3527	-0.0969	0.2725	-1.29	0.197
Land size per adult equivalent hh	-1.2947***	-0.3556	0.3076	-4.21	0.000
Current asset value	-0.0003***	-0.0001	0.0001	-4.56	0.000
Employment on own business	-0.4507*	-0.0987	0.2470	-1.83	0.069
Employment on wage	0.4497***	0.1320	0.1712	2.63	0.009
Irrigation access	-0.0491	-0.0135	0.1833	-0.27	0.789
Access to credit	-0.4022**	-0.1141	0.1582	-2.54	0.012
Access to extension services	-0.5589**	-0.2063	0.2435	-2.3	0.023
Input use	0.2142	0.0566	0.2044	1.05	0.296
Access to aid	0.0461	0.0127	0.1552	0.3	0.767
Village level infrastructural index	-0.5544	-0.1523	0.3807	-1.46	0.147
Distance to main market	0.0015*	0.0004	0.0008	1.94	0.053
Drought shock	-0.0089	-0.0025	0.1706	-0.05	0.958
Livestock shock	0.1856	0.0548	0.1796	1.03	0.303
Dega agroecology	0.2672	0.0780	0.3358	0.8	0.427
Kolla agroecology	0.7665***	0.2959	0.2717	2.82	0.005
_cons	0.1343	-	1.1221	0.12	0.905

Number of obs   =   250   LR chi2(25)   =   141.35   Prob > chi2   =   0.0000

Log likelihood = -139.07952   Pseudo R2   =   0.3369

///*, ** and *** refers to Significant at 10%, 5% and 1% Significant level respectively

Source: Compute from own survey, 2013

Household asset ownership is strongly and negatively associated with poverty depth. Ox holding has negative and significant effect on poverty gap, and the coefficient is statistically significant at 1% significance level. Households with large number of oxen have lower probability to fall under the poverty gap as compared to the households with less number of oxen holding. The household's probability of falling into the poverty gap decreases by 44.60% for one every one additional ox possessed. Other livestock holding inversely associated with the poverty gap, implies that the households with large unit of livestock (TLU) have lower poverty depth as compared to their counterparts although it is insignificant. Another important asset with negative and significant relationship to household's poverty gap is farm size measured by land size per adult equivalent. The households with larger farm size are on average less poor than those who have small farm size. Households with larger farm size have a capacity to generate more income, which enable to enhance their consumption level and subsequently improve their household poverty status. The household's probability of falling into poverty gap decreases by 35.56% for every one additional timad of land gained.

The current value of asset holding is another important asset, which is inversely and significantly related to poverty depth. It affects the household's probability to fall into poverty gap, and the relationship is statistically significant at 1% significance level. Asset holding including farm asset and household asset used to generate income and serve as a means to cope up the households from adverse shocks. Households having a large value of current asset have a lower level of expected poverty gap than those who have small value of the current asset.

The coefficient of employment on own business and wage activities are statistically significant at 5% significance level. Employment on own business has a negative impact on the poverty gap implies that households with having their own business activities would have a lower probability of falling into the poverty gap, and lower the expected poverty gap as compared to the households not having their own business. However, the effect of employment on the wage is positive in relation to the intensity of poverty. Involvement in wage employment increases the expected level of poverty gab. The main reason for this extraordinary outcome mentioned in the above welfare regression analysis.

The coefficient of household's access to credit is statistically significant at the 5 % significance level and has a negative impact on the gab of poverty. Households with access to credit have lower probability of falling into a poverty depth than households without access. Similarly, the coefficient of household's access to agricultural extension service is statistically significant and has a negative relationship with the poverty gap. With respect to the marginal effect, having agricultural extension contact reduced the probability of being in a

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poverty depth by 24.35%, holding other things remain constant. This is due to the reason that, contact with extension services provided more access to improved seeds, new production system, and other modern inputs and the knowledge that how to diversify their income sources and how to utilize it. Accordingly, access to agricultural extension service improved the farmer's productivity, and then it reduced the poverty intensity. Distance to the main market has a significant and positive effect on the poverty gap, and it is statistically significant at 10% significance level. The households with a better access to main market have lower probability of being in a poverty depth. This might be due to the reasons that access to market improves farmer's liquidity and the affordability of the inputs required for production, and it creates other job opportunities like employment on wage, petty trade, as well as it reduces the time wastage. Agroecological variation also has a significant effect on the poverty gap similar to its effect on welfare analysis. Households living in the kolla agroecological zone are poorer than those who live in the Weynadega agroecological zones. It implies that poverty intensity is highly severe in the kolla agroecological zone as compared to the other agro ecologies.

3.5.   Econometric Results on the Determinants of Poverty Gap Squared

In the above section, the study discussed on the correlates of poverty gap, and the finding of the study revealed that, household characteristics, asset holding, off-farm income participation, access to credit and agricultural extension services, remoteness to the main market and agro-ecological variation are significantly affecting the poverty gab in the study area. Similarly, the maximum likelihood estimate of the Tobit regression once again estimated to identify the determinants of the poverty severity (see Table 1.8). Accordingly, in the same condition with determinants of poverty gab, household characteristics such as family size and mean household age significantly affects the poverty severity. The households with a large number of family members have a higher probability of falling into the poverty severity than those who have a small number of family sizes and the households with aged family members have a lower probability to fall into poverty severity. The coefficient of the household's asset holdings, such as ox, farm size and the value of current asset have statistically significant and negative impact on the probability and intensity of poverty severity. Similar to the finding in the determinants of poverty gab, households with a large number of oxen, large farm size and more value of current asset has a lower level of predicted poverty severity or probability of falling into poverty severity. This is similar with the finding of (Chijioke, 2012; Asogwa et al, 2012).

Table 6: Determinants of poverty severity (Tobit model)

Explanatory variables	Coefficient	dy/dx	Robust.Std. Err	t-value
Head male	0.1837	0.0178	0.2910	0.63
Head age	0.0283	0.0029	0.0632	0.45
Head age square	0.00001	0.000002	0.0006	-0.02
Mean family age	-0.0275*	-0.0028	0.0147	-1.88
Family size	0.2117*	0.0217	0.1211	1.75
Dependency ratio	-0.2822	-0.0289	0.2533	-1.11
Number of child, 7-14years	0.2007	0.0205	0.1695	1.18
Headedu8(>=primary school)	0.3656	0.0418	0.5929	0.62
Oxen per adult equivalent hh	-2.3248***	-0.2378	0.8157	-2.85
Tlu per adult equivalent hh	-0.5549	-0.0568	0.4419	-1.26
Land size per adult equivalent hh	-2.1884***	-0.2239	0.5483	-3.99
Current asset value	-0.0005***	-0.0001	0.0001	-4.48
Employment on own business	-0.7619*	-0.0623	0.3891	-1.96
Employment on wage	0.8256***	0.0893	0.2931	2.82
Irrigation access	0.0737	0.0076	0.3241	0.23
Access to credit	-0.6484**	-0.0679	0.2669	-2.43
Access to extension services	-1.2582**	-0.1654	0.5328	-2.36
Input use	0.0517	0.0053	0.3848	0.13
Access to aid	0.0823	0.0085	0.2404	0.34
Village level infrastructural index	-0.9046	-0.0925	0.5955	-1.52
Distance to main market	0.0026**	0.0003	0.0013	1.99
Drought shock	0.0657	0.0066	0.2663	0.25
Livestochock	0.2315	0.0249	0.2781	0.83
Dega	0.1768	0.0185	0.5898	0.3
Kolla	1.0383**	0.1326	0.4463	2.33
cons	0.4518	-	1.8667	0.24

Number of obs = 250	LR chi2(25) = 135.55
Log likelihood = -170.64012	Pseudo R2 = 0.2843

///*, ** and *** refers to Significant at 10%, 5% and 1% Significant level respectively
Source: Compute from own survey, 2013

The coefficient of the household's asset holdings, such as ox, farm size and the value of current asset have statistically significant and negative impact on the probability and intensity of poverty severity. Similar to the

finding in the determinants of poverty gab, households with a large number of oxen, large farm size and more value of current asset has a lower level of predicted poverty severity or probability of falling into poverty severity. This is similar with the finding of (Chijioke, 2012; Asogwa et al, 2012).

The coefficients of household's Off-farm income involvement such as households with own business and the employment on wage have a statistically significant effect on the poverty severity with the similar sign in the determinants of poverty gap. Households with access to agricultural extension services and access to credit have a significant and negative relationship with poverty severity. This is also similar to the finding of (Asogwa et al, 2012).

Moreover, the coefficients of household's distance from main market and Agroecologocal dummy have significant and positive impact on the poverty intensity. The households in the remote area have a higher poverty severity than those who lives nearer to the main market. This is also similar to the finding of (Asogwa et al, 2012). The households living in the Kolla agroecological zone have higher poverty intensity than the households living in the Weynadega agroecological zone.

3.6.   Inequality

As mentioned in the table 7, around 9.64% of all expenditures were made by the poorest fifty households of the sample unit (first quintile group). It implies that the poorest 20% of the household consumes only 9.64% of the average consumption expenditure per month. However, the share of monthly consumption expenditure per adult equivalent of the richest 20% of the households in the study area accounts for 36.4%. In general, the mean consumption expenditure of the poorest 40% of the households is still smaller than the share of the top quintile. The Gini-coefficient for the study area estimated using the DASP distributive analysis, and it accounts 0.27.

Table 7: Mean consumption expenditure in each quintile group

Consumption expenditure by Quintile group	N	Mean	SD	Percentage
First quintile	50	209.82	36.63	9.64
Second quintile	50	292.63	21.20	13.44
Third quintile	50	380.86	34.06	17.50
Forth quintile	50	501.12	36.26	23.02
Fifth quintile	50	792.43	206.43	36.40
Total	250	2176.87	224.94	100.00

Source: Compute from own survey, 2013

4.   Conclusion and Policy Implication

Although, various food security programs such as safety net program, rural household's agricultural extension services and credit access were implemented widely, the problems of poverty is spreading widely in the rural households in general in the Gubalafto Woreda in particular. Accordingly, in the district more than 30 percent of the households were found to be poor implies that they could not get the minimum and above recommended calorie level of 2200 kcal per adult per day.

The basic asset holding particularly land size and number of oxen were found to be an extremely low. The average number of oxen and land size per households were less than one ox and around 0.5 hectare of land respectively. Poverty deeply correlated with household characteristics and asset holding. Poverty decomposition result shows that, large family size shrinking the economic resource and dipping the income generating capacity of the households and the households with a large number of family sizes had a significantly higher probability of falling into the poverty gap as well as the intensity of poverty. Therefore, serious attention has to be given to limit the increasing population in the study area. Expanding the effective extension services to increase awareness among rural households (both men & women) in using family planning to reduce fertility is required with considering the replacement and the mortality rate in the rural households of Gubalafto woreda. On the other hand, dependency ratio has a significant and positive correlation with the welfare of the households. This implies that households with a large number of dependents relative to the number of adult households were in a better position. This is implicitly indicated that, the size of adult labor in the household seems not to have a positive contribution or improvement of the welfare of the households due to underling negative marginal returns to the adult labor and poor function of labor market in the study area. Thus, this calls for policy measures that attack poverty and its intensity through increasing investments in employment creation and productivity enhancement to mobilize the idle labor resource as well as to increases the labor productivity.

On the other hand, asset holding such as, livestock holding (particularly oxen), land size and non-livestock assets, access to irrigation and participation on own businesses activities were significantly enhanced the household's welfare and mitigating the incidence and severity of poverty. Factors like number of ox per adult and current value of asset holding (both farm and household asset) found negatively correlated with the household's vulnerability to poverty. Therefore, this is an insight that rural household asset bulling program should be implemented to enhance households welfare and reduces poverty and vulnerability to poverty.

Whereas, in case of limited farm size, tackling the problem of poverty through increasing farm size would not bring any sustainable development. As a result, strong efforts should be made to improve the production and farm income through providing agricultural credit services and agricultural extension services. Infrastructural facilities especially the transportation system is not well developed and particularly the households in the Dega agr-oecological zone supposed to traveled more than 41Kms to access transportation services. Therefore, policy measures required for creating and expanding the self-employment opportunities accompanied with strengthening the transportation facilities. Moreover, human capital plays a significant role in the poverty alleviation. Household head with at least primary school complete has a lower level of poverty incidence and intensities of poverty.

In addition, public services such as access to credit and agricultural extension services significantly affect household's welfare, poverty intensity and vulnerability to poverty with the expected signs. Therefore, expanding rural credits and agricultural extension services to subsistence farmers should be one of the main areas of intervention and policy options.

Finally, the regression results also revealed the importance of village level factors. Households far from the main market have a lower level of welfare status and they have a higher level of poverty intensity. Households in the remote areas are also highly vulnerable to poverty. This calls the policy measures to address inadequate market access through investments in marketing infrastructures, such as market stalls, rural access roads, transportation facilities and agricultural price information systems. Moreover, the private sector and NGO's should be encouraged to invest in agricultural input and output market infrastructural facilities. The coefficient of the village level infrastructural facility has a significant and negative effect on the household vulnerability to poverty. Village level infrastructural facilities contributed to the households to have a diversified and a stable source of income, and hence it reduced the household's vulnerability to poverty. This calls the policy measures to alleviate the rural household vulnerability to poverty through investment in the infrastructural facilities.

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