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RESEARCH ARTICLE

RURAL HOUSEHOLD POVERTY AND ITS DETERMINING FACTORS: A POVERTY ANALYSIS USING ALTERNATIVE MEASUREMENT APPROACHES

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Abstract

Poverty analysis studies in Ethiopia are dominated by measures determined by the subjectivity of the researchers and not with the involvement of households in understanding and measuring what is meant to the people. Studies conducted to take into considerations the knowledge of the poor are very scant and limited to rural participatory projects. This study is motivated to bridge the literature gap of comparing the objective measuring of poverty with a measure that accounts the perception of households about poverty. Hence, this study aims at examining rural household poverty and its determining factors using alternative poverty measurement approaches inGozamin district of East Gojjam Zone, Amhara Region. It used both objective and subjective based poverty analysis approaches, where the poverty line of the study area is estimated as 19.16 Birr per day using cost of basic needs approach. The study indicates that 35.12 % of the population lives under poverty and it is closely estimated as 33.33% using Participatory Poverty Assessment (PPA). Poverty is rampant and a sever challenge in Dega(cold) agro-ecology of the District, where 57.37% of the population lives under poverty compared to Kolla(hot), where it is down to 8.4%. Among others, family size and being in Kolla agro-ecology have significant negative effect on consumption expenditure, but positively affect poverty incidence, gap and severity, while access to credit, cooperative, health extension services and off-farm activities have significant but exactly opposite results. PPA findings revealed that, perception of the community towards poverty is beyond the conventional, income/consumption based definition. Therefore, development policies and poverty reduction strategies should emphasie on local level poverty understanding and measures.

Introduction:-

There is a commonly used public proverb that says “there are so many words which are getting old without being internalized properly”. The basic idea is to emphasize the exstiance of too many issues which are frequently raised and discussed by development agents, political leaders and ordinary peoples without having in-depth understanding and know how. Poverty is among those issues raised and discussed in each and every corner of the development agenda, while it needs critical understanding to contextualize and internalize beyond the mere word, poverty.

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Although poverty is a widely used concept in all countries of the world, there isn't universally agreed upon definition which can serve for all disciplines. "It often seems that if you put five academics (or policy makers) in a room you would get at least six different definitions of poverty" (Gordon, 2006). The United Nations (UN) defined absolute poverty as "a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It is dependent not only on income but also on access to services" (UN, 1995).The Programme of Action of the World Summit for Social Development (United Nations, 2006, resolution 1, annex II) characterized poverty as follows: Poverty has various manifestations, including lack of income and productive resources sufficient to ensure sustainable livelihoods; hunger and malnutrition; ill health; limited or lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments; and social discrimination and exclusion.

The World Bank's definition of poverty indicates that poverty is "...a pronounced deprivation of well-being related to lack of material income or consumption, low levels of education and health, vulnerability and exposure to risks and voiceless and powerlessness (World Bank 2001a, as quoted by Pradham& et al., 2002). In terms of money metric measurement, households with daily consumption of less than World Bank's famous poverty line, $1.25 per person per day are considered to be living in extreme poverty. A dollar- a day poverty line was revised by the World Bank to $1.25 per person per day in 2008 using the international price of the year 2005 and the head count poverty rate is used as measurement to show the proportion of the overall population living below $1.25 per person per day.

Based on the World Bank policy research report (2015), substantial progress had been made to reduce global poverty in the past few decades where the number of people living in extreme poverty reduced by half to around 1 billion (14.5 percent of the world's population and 17 percent of the developing world's population) between the years 1990 and 2011. From the above figure, Sub-Saharan Africa countries account the largest proportion, 415.4 million people (46.8 percent of the Region's population) followed by South Asia with 399 million people, 24.5 percent of the population(World Bank, 2015). Ethiopia is among Sub-Saharan Africa countries and a home of 90.07[1] million people, the second populous country in Africa with 80.6 percent rural population. Based on Central Statistics Agency (2015), 29.6 percent of the country's population lives below poverty line and this figure goes up to 30.4 percent in rural areas.

Despite remarkable progress achieved to reduce absolute poverty, it remains a widespread challenge in many parts of the world, especially in Sub-Saharan Africa. Ethiopia has registered outstanding performance to reduce poverty from 56% in 2000 to 31% in 2011 (World Bank, 2014). However, about 14 % of non-poor households in Ethiopia today consume only just enough to live above the poverty line which makes them easily vulnerable to fall into poverty. Moreover, more than 60% of Ethiopia's populations are categorized under moderate poor and receive $1.25 to $ 4 dollar per a day (World Bank Group, 2015). This shows that the progress to escape out the population from poverty can be easily reversed back unless the country's development policies and strategies are designed based on scientific studies and research findings to address multi-dimensional effect of poverty. Besides, poverty appears to persist in large sections of the rural society, where poverty head count ratio was 45.4% and 36.9% in rural and urban community's respectively (MoFED, 2002). Ethiopia Central Statistics Agency (2015) indicates that poverty rate of the country is 26.9%; while the figure goes up to 30.4% in rural areas. .

However, many studies are conducted on poverty, only a few are dedicatedon rural poverty which is highly important for countries with large rural population like Ethiopia. Most poverty studies including; Dercon & et al, (2012, Bogale and et al. (2005), Alemayhu & et al (2005), Hagos and Holden (2003), Bogale and Korf (2009), Fredu (2008) ogale and Genene (2012), Demeke & et al. (2003), (Asogwa & et al, 2009), Runsinarith (2011) have used a single objective based poverty measurement. Bradshaw (2001) in his poverty measurement analysis argued that it is important not to rely on a single measure of poverty, but attempt to triangulate a variety of measures. Ravillon (2012) also emphasized the importance of utilizing subjective data in poverty measurement beyond relaying on objective measurements. Hence, the purpose of this research is to examine rural household poverty and its determining factors using alternative poverty measurement approaches in the case of GozaminWoreda, East Gojjam Zone of Amhara Region. The study utilized alternative poverty measurement approaches, where it has gone through both objective and subjective methods of poverty analysis. The specific objective of the study strives to assess the

[1] Federal Democratic Republic of Ethiopia Central Statistics Agency (FDRE, CSA) population projection for the year 2015

poverty status in rural areas of the specific study area; analyze, compare and contrast poverty status of rural households using alternative poverty measurement tools and investigate determinants of rural household poverty in Gozamin district.

Theoretical and Empirical Analysis of Poverty

Theoretical Perspectives of Poverty

Different economic schools of thoughts have different views on povertysince the development of classical theory in 18th and 19th century. Classical economic theory which includes the prominent work of Adam Smith and David Ricardo emphasized individuals' responsibility for poverty as a foundation for laissez-faire policies, while neoclassical theory is more diverse and provides an explanation for poverty, mainly market failure beyond individual control (Davis, 2014). Taking the classical traditions as a base, neoclassical theory focuses on the role of the uneven initial endowments of talents, skills and capital, which determine productivity of an individual in generating poverty, within a market-based competitive economic system. Market failures such as externalities, moral hazard and adverse selection, as well as incomplete information are also viewed as aggravators of poverty (Davis, 2007). Keynesian or Liberal theory adhere that underdevelopment with its multiple facets causes poverty beyond market distortion. Keynesians suggests that growth can promote economic development and thus eradicate poverty; hence this theory further justifies the role of government intervention at the macroeconomic level through fiscal and monetary policy, mainly to tackle involuntary unemployment.

Marxian or Radical theory suggested that the cause of poverty is capitalism and related social and political factors based on class division. This school of thought advocates that "the market is inherently dysfunctional" (Blank, 2010). According to this school of thought, poverty in capitalist economy can only be alleviated through undertaking strict market regulation like minimum wage since it is believed that capitalist societies keep the cost of labor abnormally lower than its value added through the threat of unemployment (the "reserve army of unemployed"). Marx argued that an inherent dysfunction of the labor market is due to the presence of unemployed workers, which is ultimately caused by the need of capitalists to have surplus labor through artificially lowering wages.

A wider range of authors in the political economy field suggest that structural factors, including stratified labor markets as well as prejudice and corruption are major causes of poverty. In the above cases, the policy implication is that anti-discrimination laws and labor market reforms are essential to overcome structural barriers that impede employment and cause poverty (Davis, 2014).

In different outlooks, few literature provide theoretical base of poverty using three major schools of thoughts; Welfarist school, the Basic Need School, and the Capability schools (Asselin& Dauphin, 2001). Welfarist approach considers economic well-being sometimes referred as economic welfare as the lacking part to define poverty. In line with the framework of welfarist schools, Lipton, &Ravallion (1993) explained that "Poverty can be said to exist in a given society when one or more persons do not attain a level of economic well-being deemed to constitute a reasonable minimum by the standards of that society." The lacking part for basic need approach is basic goods and services specifically identified and believed to meet the basic needs of all human beings. For capability approach, the missing part is not utility or fulfillment of basic needs rather human abilities or capabilities. The capability school considers as poor if a person that doesn't have the possibility to achieve a certain subset of functioning. The functioning varies from such elementary physical ones as being well-nourished, being adequately clothed and sheltered to more complex social environments such as taking part in the life of the community, being able to appear in public without shame and so on (Asselin& Dauphin, 2001).

Empirical analysis ofpoverty

In order to understand extent and severity of poverty as well as major determinants, it is peramount to review conducted empirical studies everywhere in the world with due emphasis for studies undertaken in African rural context. Bogale and et al (2005) carried out a study entitled as "Determinants of Poverty in rural Ethiopia" in three purposely selected administrative districts of Ethiopia and found that poverty rate was 38%(urban) and 43%(rural) with 0.0466 poverty depth. This indicates that a resource which accounts 4.66% of the poverty line for each individual and distributed to the poor as per their need in order to come up each individual to the poverty line and that can lead to say at least poverty could be eliminated theoretically.Similarly, Hagos and Holden (2003) studied poverty determinants in the rural households of Tigray 1997-2000, and revealed that around 61 %(urban) and 66 %(rural)of the population in the region are living below the poverty line of meeting basic consumption requirements. Consequently, they were revealed that, human capital resources like educated heads and heads with any kind of

acquired skills and physical asset endowments such as farm size, livestock holding including oxen were found to have significant welfare enhancing effects.

Bogale and et al (2005) revealed that male-headed households have high probability of being poor considering per capita food energy consumption, while female-headed households have the same scenario if household consumption expenditure measurement is considered. This indicates that, though male-headed households have better capacity to comply with the minimum consumption expenditure required, they failed to realize it in terms of actual food consumption. However, female-headed households allocate their available resources in such a way as to obtain more calories per capita than their counterpart. In contrast, Alemayhu & et al (2005) found that female-headed households are more likely to be poor than male-headed households in Kenya.

A study on poverty and its determinants among smallholder farmers in the eastern Hararghe 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. In the same area, Bogale and Genene (2012) applied similar methods for poverty analysis and they found that around 38% of the sample households live in absolute poverty. Multivariate regression result of their study revealed that family size, educational level of any household member, size of own land, age of the household head, livestock holding, amount of credit received, frequency of extension visit were significant variables that affect household's consumption expenditure, hence welfare.

Demeke et al. (2003) found that demographic characteristics such as family size at different age categories, livestock ownership, land holdings and education are significantly associated with household consumption expenditure. All the above determinant variables except household size affect household welfare positively and also male headed households have greater consumption per capita than their counterparts.

The study on determinants of rural household poverty severity in Nigeria using data from randomly sampled 233 rural farmers in Benue State revealed that coefficients of dependency ratio and household size had a significant and positive relationship with poverty severity. However, access to credit, agricultural extension services, market access, farm size and membership in cooperatives or other farmers' associations had a significant and negative relationship with poverty severity. This indicates that the poverty intensity strongly associated with household characteristics, asset holding, access to different public services and infrastructural facilities (Asogwa et al., 2009).

Using three years panel data, Runsinarith (2011) examined the determinants of rural poverty in Cambodia and revealed that dependency ratio, large family size and shock had negative and significant effect on household consumption expenditure. On the other hand, livestock, irrigated land and access to micro finance service were exerting significant positive effects on per capita consumption expenses.

Poverty Assessment conducted in Niger using participatory assessment tools revealed that 59% of respondents perceived living conditions as a sort of sieve that has allowed poverty to seep in. The community considered poverty by associating with quality of life and as a process of ongoing deterioration in living conditions. The study indicated that the communities understand that poverty begins with penury, and then turns into an inability to act, and finally leads to dependency and destitution. In other words, the population does not view poverty as a static condition, but instead as a process. It is first an economic phenomenon that then takes on a social dimension, and in the end becomes a reality with psychological repercussions.

Data and Research Methods:-

Data

The study mainly depend on cross-sectional primary data collected from rural households in 2020 using semi-structured questioner and participatory poverty assessment tools for objective and subjective based poverty analysis respectively. The study utilized a mix of stratified, proportionate and systematic random sampling techniques where it was passed through two major steps. Depending on the three major agro-ecological zones of the district, Kebeles (PAs) were categorized under Dega (cold), Woyena-Dega (mild) and Kolla (hot) agro-ecological zones. It is also common to observe that the production potential of the study area, Gozamin District, in two major categories; the less productive highland and the productive low land area. As initial step, 25 rural Kebeles of the district were

stratified under the three major agro-ecological zones and four rural Kebeles (one fromDega; two from Woyena-dega and one from Kolla) agro-ecological areas were selected randomly.

Secondly, households of the selected kebeles were stratified based on the sex of the household head (male headed and female headed) which intended to get appropriate representation of female headed households. Accordingly, proportionate number households were drawn from each Kebele (PA) and sample households were selected from each stratum using systematic random sampling technique.

Sample size determination formula ofYamane (1967:886) was applied as follows:

$$n = \frac{N}{1 + N(e^2)} \quad \rightarrow \quad \text{n} = \frac{3{,}674}{1 + 3{,}674\ (0.07)}$$

Where,n represents the sample size,N denotes the total population of the study and$e$ represents the level of precision. It is common to use 95% confidence interval (precision level of 0.05) to determine sample size; however, this study has taken 93% confidence interval (0.07 precision level) considering the cost and availability of time without compromising the probability of generating reasonable sample which can represent the entire population of the study. The total population of households in four randomly selected Kebeles (Pas) is 3,674 (WOA, 2018).Accordingly, a total of 242 (193 +25% contingency) households was selected for objective based poverty survey. Besides, two among four sample kebeles were selected from different agro-ecological categories to conduct participatory poverty assessment. A total of 42 participants (52.38% male headed, 26.19% male headed, 9.52% elders and 11.91% youths) were randomly selected to undertake subjective poverty assessment. Representativeness of PPA participants was maintained through randomly selecting participants from different community categories where male and female headed households, elders and youths were included. In order to reduce information biases and the help study to address more households for over all poverty assessment, PPA participants were selected from sample frame of households who were not selected for survey based assessment.

Research Methods:-

In this study, the FGT indices are used to measure poverty status, gap and severity. Objective based poverty measurement ofFGT approach is also complemented with a subjective poverty assessment using Participatory Poverty Approach (PPA) which enable tomake triangulations on poverty assessment methods and provide realistic estimations of poverty in the study area. The determinants of poverty have been analyzed using both the Logit and Tobit models. Detailed discussions on the methods used in this study are provided below.

Poverty Measurement Approaches

Household consumption expenditure was used as better welfare indicator, since it is considered as more closely related to a person's well-being and may better reflect a household's actual standard of living to meet basic needs. Consumption expenditure can reflect not only goods and services that a household can command based on its current income, but also whether that household can access credit markets or household savings at times when current income is low or even negative, may be in case of seasonal variation, harvest failure or any circumstances that cause income to fluctuate widely (Coudouel & et al, 2002). Food and non-food consumption expenditures are the two major components, where food consumption expenditure includes expenses of 27 different food items with a recalling period of one month and seven days depending on the nature of the food item. Before totaling, all individual consumption expenditure values were converted in annual terms. Before constructing a comparable welfare indicator among households, adult equivalent was calculated for each household that enable to set common ground to measure consumption expenditure per adult equivalent.

Food poverty line of the study was constructed using Cost of Basic Needs (CBN) approach, where food poverty line was augmented by share of non-food consumption to come up with the total poverty line of the study area. CBN approach is based on the estimated cost of the bundle of goods "adequate" to ensure that basic needs are met.

The first step to set poverty line using CBN approach was arranging households in ascending order based on their consumption expenditure and the lower 50% of the sample households were taken as a reference group. The basic reason of taking the second-lowest quintile is due to the possibility of stipulating various consumption bundles which can meet the required 2,300 Kcal per person per day. Representative food bundles which are common diet of the poor were taken to set the poverty line. That was taken as good strategy to reduce the likelihood of having a fantasy poverty line due to unrepresentative households who are affluent in the community.

Secondly, the total calorie obtained from the consumption of average quantity per adult was estimated based on Food and Agriculture Organization (FAO) food composition table for international use. The average quantity per adult equivalent of each food item was scaled up/ down by a constant value (share of recommended calorie per adult equivalent per day to the total calorie obtained by individual adult equivalent from consuming the average quantities per day) in order to get the recommended calorie per adult equivalent per day. Thirdly, each food item was multiplied by the median price and summed up to get a food poverty line in monetary terms. Subsequently, the food poverty line was augmented by the share of non-food consumption expenditure per adult equivalent of the reference group. Finally, the total poverty line was generated through adding up the food poverty line and share of non-food consumption augment

In order to express the above poverty line setting approach using mathematical formula, the researcher adopted the formula used by Ravallion and Bidani (1994) as follows:

$$\sum \mathrm{Q_i\,Kcal_i} = \mathrm{T^*} \text{ with the assumption of } \mathrm{T} \cong \mathrm{T^*}, \text{ but } \mathrm{T} \neq \mathrm{T^*}$$

Where, $\sum Q_i\, Kcal_i$ indicates the total amount of calorie value obtained from the consumption of the specified food bundles of average quantity per individual adult.
T^* = the total calorie obtained from consuming the average quantities per adult per day
Q_i = average quantity per adult equivalent of food item "i" consumed by individual adult
$Kcal_i$ = the caloric value of each respective food item "i" consumed by individual adult
T= the value of nationally recommended calorie requirement per adult equivalence per day (for the purpose of this study, 2,300 Kcal/adult/day was adapted).
The average quantity per adult equivalence of each food item $Q_i$was scaled up/scale down using the constant value $\frac{T}{T^*}$ in order to get the exact value of the recommended amount of calorie (2,300 Kcal) which can be represented by adjusted q_i. Then, the adjusted average quantity each food item per adult equivalence $q_i$was multiplied by the median price and the total sum of each product provided the food poverty line.

$$\sum q_i\, \tilde{p} = Z^F$$

Where, q_i represents the adjusted average quantity per adult equivalence of each food item, $\tilde{p}$ represents the median price and Z^Frepresents the food poverty line.

Despite there is no unanimous agreement to draw the non-food component of the poverty line from the consumption expenditure Haughton &Khandker (2009), the study utilized the following procedure in order to come up with a non-food poverty line which can nearly reflect basic non-food consumption expenditure of the lower poor community groups. The non-food component of the poverty was developed through taking the share of non-food consumption expenditure of the lower reference group.

The non-food share of total consumption expenditure estimated through regressing the food share $(f_i)$of each household (i)on a constant and the log of the ratio of total consumption expenditure to the food poverty line(Z^F): $f_i = \alpha + \beta\, log\left(\frac{Y_i}{Z^F}\right) + e$Where, f_i refers to the share of food item from the total household consumption expenditure, Y_i denotes household's total consumption expenditure, β regression coefficient and α is the intercept which accounts the food share when $Y_i = Z^F$, and e is simply referring the error term. Then after the computation of the value of α , the non-food share of total expenditures is $1 - \alpha$ and then the total absolute poverty line is:$nf_i = (1 - \alpha) + \beta\, log\left(\frac{Y_i}{Z^F}\right) + e$When, $Y_i = Z^F$ Where, nf_i refers non-food consumption share from total expenditure. Accordingly, total poverty line of the study area was calculated as:$Z^T = Z^F\,(2 - \alpha)$ Where, Z^T represents the total poverty line using cost of basic approach.

In addition to the household consumption expenditure, a combination of household demographic, socioeconomic and community characteristics are chosen for poverty analysis. These include; age of the household head, a binary variable to capture sex of household head (male headed=1), ability of heads to read and write (literate=1), dependency ratio (household members younger than 15 and older than 65 years divided by total number of working age family members), land size in hectares, livestock in TLU, value of farm implements and household durables, distance to nearest market, access to credit (accessed =1), access to cooperative service(accessed =1), access to irrigation(accessed =1), access to health extension(accessed =1), frequency of health extension visit, agro ecology(lowland/kola=1, midland/woyena-dega=2, highland/dega=3). working age household members, a binary

variable capturing whether the household has got social assistance from relatives and friends (=1), household oxen ownership, a binary variable that capture whether the household has access to credit services (=1), income diversification index, distance to main road and market centers in kilometers (km), a binary variable capturing whether the household is located in lowland (=1), midland (=1) and highland (=1) agro ecology. To create our measure of income diversification index, we use principal component analysis method.

Poverty profile:

A common way to construct the poverty profile is regressing individual poverty measure against a variety of household characteristics. $\frac{Y_i}{Z_i}$; (or its log) is a function of a vector of observed household characteristics X_i mathematically, $\frac{Y_i}{Z_i} = \beta X_i + \varepsilon_i$Where, Y_i represents consumption expenditure of a household per adult equivalenceZ_i, represents the poverty line; β is coefficient of the characteristics X_i is household characteristics and ε_i is error term. Hence, the binary variable can be defined as, $H_i = 1$ if$\frac{Y_i}{Z_i} < 1$ and H = 0 otherwise. The method then pretends not to observe the Y_i's, acting as if only H_i and the vector of characteristics X_i is observed. The probability of a household being poor would be P = Prob$\left[\frac{Y}{Z} < 1/X\right]$= Prob$[\varepsilon < 1 - \beta X]$ = F$[1 - \beta X]$, where F is the cumulative density function specified for the error term.

Poverty indices decomposition:

The study engaged FGT group of poverty measures to examine the prevalence of poverty using the headcount index, depth of poverty using poverty-gap index and severity of the poverty using poverty squared-gap index. All Foster-Greer Thorbecke classes of poverty measure indices will be addressed through the following formula:$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{Z-Y_i}{Z}\right]^\alpha$, for some non-negative parameterα , whereP_α, is simply the mean over the whole households of an individual poverty measure which takes the value of $(1 - Yi/Z)^\alpha$ for the poor and zero for the non-poor.α, is a nonnegative parameter indicating the degree of sensitivity of the poverty measure to inequality among the poor and it is known as poverty aversion parameter. In this case, the head count index has=0 , while the poverty gap index has $\alpha = 1$ and severity of poverty P_2 has $\alpha = 2$

Determinants of household consumption expenditure:

Consumption expenditure per adult equivalent was taken as basic indicator of household welfare where identifying its determinants could be key step in poverty analysis. The study identified determinants of consumption expenditure through regressing consumption expenditure per adult equivalent against a series of independent variables that affect household consumption expenditure exogenously.

$$\log(C_i) = \alpha + \beta X_i + \epsilon_i$$

WhereC_{hi}, refers to consumption expenditure per adult equivalent of household(i). X_i, is the set of explanatory variables, α is a constant term, β indicates the regression coefficients, and ϵ_i is error term which is assumed to be normally, independently and identically distributed with mean 0 and constant variance. In order to reduce the usual asymmetry in the distribution of the error term and stabilizes the variance, household consumption expenditure per adult equivalent was transformed in to logarithmic form.

Determinants of poverty status:

A binary logit regression was used where the dependent variable takes a binary form either "poor" or "non-poor". To identify key determinants of poverty status, the first step was computing a dichotomous variable indicating whether the household is poor or not. That is,

Poverty status of a household = $\begin{cases} 1, \text{if a household is poor} \\ 0, \text{otherwise} \end{cases}$

Then, the logit regression model can be illustrated as follows:$\text{Logit}(P_i) = \ln\left[\frac{P_i}{1-P_i}\right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_n X_n$Where, $X_1, X_2, \ldots X_n$ refers the predictor variables including age of household, size of household, educational level of the household head, land holding size and other characteristics of the household.

Determinants of poverty depth and severity:

The study applied censored (Tobit) regression model in order to examine determinants of depth and severity among poor categories of households. $P_i = \left[\frac{Z-C_i}{Z}\right]^\alpha$ if $C_i < Z$, and $P_i = 0$ otherwise Where, α is a parameter which can

take a value of 1 and 2, P_i refers poverty gap (if $\alpha = 1$) and poverty severity (if $\alpha = 2$) of the household (i) respectively. C_i , refers consumption expenditure of household per adult equivalent andZ, indicates poverty line. A censored dependent variable, C_i^*equal to the consumption expenditure per adult equivalent of poor households but fixed at the poverty line for the non-poor. This can be expressed as: $C_i^* = C_i$ if $P_i > 0$, and $C_i^* = Z$, otherwise

Hence, the censored regression model to identify determinants poverty depth and severity can be formulated as:$C_i = \beta X_i + \epsilon_i$ if $P_i > 0$where, X_i refers different explanatory variables, β denotes coefficient of determinant variables and ϵ_i is error term.

Participatory Poverty Analysis:
The study utilized PPA in order to triangulate and complement the findings of obejective based poverty assessment which passes through various regression analysis techniques. Focus group discussion, well-being ranking and scoring matrix were major PPA tools used to collect qualitative information from respondents.

Poverty Analysis
Poverty profile of the area
Based on the estimated poverty line of the study area, households are categorized under poor, which refers households who hadn't sufficient spending to meet the minimum daily calorie requirement and non-poor, those who made enough spending to fulfill their daily minimum calorie requirement, 2300Kcal. Using CBN approach, the poverty line in the study area is estimated as ETB19.16/ault/day. Accordingly, 35.12% of households in Gozamin district are living under poverty and poverty gap in the study area is 9.54% in which at least 9.54 % of the poverty line should be transferred to the poor to bring them up to the level of poverty line.Poverty gap does not take into account the inequality among the poor since it shows the overall mean of poverty gap between the consumption expenditure of the poor and poverty line. On the other hand, poverty squared gap measures both the poverty gap and inequality among the poor, and the index gives higher weight for those who far away from the poverty line. The poverty squared gap in Gozamin district is 3.41%. The higher the value of this index implies that the higher severity of poverty poverty squared gap (weighted sum of poverty gaps).

Poverty Decomposition
Poverty decomposition was done across sample PAs, ecological zones and socio-economic characteristics of rural households. Poverty is more sever in highland areas (57.37% of the population is poor as per head counting index) followed by midland areas where 36.88% of the population is below absolute poverty line, wile only 8.47% of the population in lowland agro-ecological areas lives under poverty which indicates that poverty level is lower in lowland areas of the district. Households who have a family size of above or equal to the mean exhibit high poverty profile, 43.55% than those who have family size below the mean 26.27%. Households who owned land above or equal to the mean size have lower poverty status 30.09%, while the above figure goes up to 38.84% for households who hold land below the mean. Besides, households who acquire above or equal to the mean value of farm implements and household durables, livestock in terms of TLU, engaged in additional livelihood options and have access to cooperative service have registered lower poverty profile.

Determinants of household consumption expenditure
The study utilized consumption expenditure as preferred household welfare indicator and engaged Ordinary Least Square (OLS) regression to identify determinants of household welfare. In this case, the dependent variable was the log transformed value of consumption expenditure per adult equivalent per day. Accordingly, livestock holding, engagement on off-farm activities have significant positive effect on consumption expenditure, agro-ecology (hot to cold) and household size have significant negative effect on household consumption expenditure. Meanwhile, land holding, farm implements and household durables, access to cooperative, irrigation and health extension services have positive effect on rural household welfare. This finding is similar with (Hagos& Holden, 2003; Tsehay and Bauer, 2012).

Determinants of poverty status, depth and severity
Using a binary logit regression model, the study identified that, access to credit and cooperative services as well as engagement on additional livelihood options (off-farm activities) significantly determine poverty status of rural households. On the other hand, household size, dependency ratio and agro-ecology from Kolla (hot)-Dega (cold) have positive effect on poverty status of households, whichindicates poverty status increased with an increase of indicated demographic factors and moving from hot to cold areas.

The study engaged censored regression (Tobit) regressionto observe the depth and severity of poverty among households categorized under poor using the latent variable consumption expenditure per adult equivalent. In other words, the latent variable, consumption expenditure per adult equivalent is only observed for households who are below the cutoff point (poverty line).Accordingly, household's engagements on off-farm activities, access to credit, irrigation and cooperative services arethe most significant factors to reduce poverty depth and severity, while household size and agro-ecology (from hot-to-cold) have shown significant contribution to escalate poverty depth as well as severity in rural households.

Participatory Poverty Analysis

Focus group discussion participants of the study defined poverty as "a situation that leads human being's life to sub-human state due to long-term illness, disability, lack of basic resources like land, livestock and money". The definition includes other aspects of well-being beyond the conventional poverty measurements that ensures the multidimensional nature of poverty. This indicates that understanding of the community towards poverty is a part and parcel of the definition provided contemporary theories and institutions (World Bank, 2004).

Well-being ranking on poverty status revealed that 33.33% of the participants are categorized under poor. The subjective poverty status of highland (cold) areas is higher than lowland (hot) areas and female headed households are poorer, 46.15% than male headed households, 27.58%. Rural household poverty measured using PPA, 33.33% is closer to survey based result which is 35.12%.

Participatory scoring matrix on poverty determinants revealed that a household who has large farm size, large number of livestock, access to irrigation, good health status and no disabilities is believed to have lower probability to fall under poverty. Preparing excessive fests is also indicated as determinant factor of poverty where a household who organized excessive fests and ceremonies has high probability to fall under poverty. Similar to monetary approach, access to extension service has registered less significance for poverty reduction.

Conclusions:-

Despite the intensive efforts of government and non-government agencies through devising multiple development strategies, poverty remained a critical challenge for the society, where 35.12% (n=242) households are found to be poor which implies that they couldn't get the minimum daily energy requirement of 2,300 Kcal per adult equivalent. Highland areas of the district with cold agro-ecology are poorer than the remaining major climatic zones, where poverty status of rural households reached 57.37%. Besides, the average proportionate poverty gap of the Woreda indicated that at least 9.54 % of the poverty line should be transferred to the poor to bring up poor households to the level of estimated poverty line.

Poverty status of the area is correlated with family size, literacy level of household heads, farm implements and household durable assets, access to cooperative services, distance to market and off-farm activities. Large family size reduces economic resource and income generating capacity of the households and results higher level of poverty. Similarly, literacy level of the household heads has great contribution to enhance household welfare, where poverty status significantly varies among illiterate and litrate households which is 41.14% and 23.81% respectively. Households who engaged in different off-farm activities (additional livelihoods) have significantly lower poverty status than others. Besides, increasing households' asset holding such as livestock, farm implements and household durables, and access to cooperative services are considered to be major issues to enhance the household's welfare and mitigating the incidence and severity of poverty in the study area.

Household size is a significant determining factor for all poverty decomposition categories (incidence, depth and severity). Education status of the household head is significant to determine poverty status, while less significant to determine the depth and severity poverty. Other household characteristics including; dependency ratio, sex of the household head are less significant to determine poverty indices. Access to irrigation, credit service, cooperative services, health extension service, engagement in off-farm activities and agro ecology are significant determinants of poverty with slight variation on their level of significance across poverty decomposition measures

On the other hand, the study utilized Participatory Poverty Assessment (PPA) to complement and triangulate findings of the conventional poverty assessment approach. PPA findings revealed that, the perception of the community towards poverty is beyond the conventional income/consumption based definition. Using well-being ranking, poverty status of the households estimated to be 33.33% which is more or less closer to the findings of

quantitative analysis. This indicated that poverty status of a given area could be alternatively estimated with PPA approaches.

Findings of participatory scoring matrix indicated that, a household who has large farm size, large number of livestock, access to irrigation, good health status and no disabilities is believed to have lower probability to fall under poverty. Preparing excessive fests is also indicated as determinant factor of poverty where a household who organize excessive fests and ceremonies has high probability to fall under poverty. Similar to monetary approach, access to extension service has registered less significance for poverty reduction. Differently, PPA revealed that, education status of the household head and number of children (having large number of children) received less attention to determine poverty status. This could be due to the fact that the community considered children as contributors rather than dependants since children in rural household start to support their family at their early ages.

Recommendations:-

The very essence of scientific research is to draw policy recommendations, actions to be taken or the need to conduct further investigations on certain societal or economic problems. The following recommendations are pointed out based on important findings of the study.

1. Family size, as prominent characteristic of households, is identified as major determinants of household's consumption expenditure; incidence, depth and severity of poverty in the study area. Large family size significantly reduces household consumption expenditure per adult equivalent; increases the probability of households to be under poverty as well as falling into poverty gap and poverty severity gap. Henceforth, development programs and projects should consider the impact of rapid population growth in rural areas that can limit the success and realization of intended development goals. It is important to strengthen health extension services in order to increase awareness among rural households regarding to use family planning to reduce fertility. Moreover, it is recommended to work with multi-sector stakeholders to mainstream reproductive health and family planning across all development programs.
2. 65.29%of rural household heads in Gozamin district are illiterate and the figure goes up to 82.86% in case of female headed households. Since literacy level of household heads is a significant determinant to fall under poverty, devising and undertaking appropriate strategies to improve literacy status of rural communties particularly female household heads could have multiple effects and take a step forward to reduce poverty status of the district.
3. Household assets such as land and livestock holding, farm implements and household durables significantly improve household consumption expenditure. Thus, poverty reduction programs should provide due attention for asset building in order to enhance household's welfare.
4. Households who are living in Dega (cold) agro-ecological zones have significantly lower welfare status, high poverty in terms of incidence, depth and severity. The study shows that, there is huge difference on poverty status across agro-ecological zones of the district. This could be used as ringing bell for responsible government and non-government development actors on the need to provide specific attention for Dega (cold) agro-ecological areas through designing or adjusting area specific development strategies to diversify livelihood opportunities.
5. Additional livelihood mean (off-farm activities) is another powerful determinant, where households who have additional livelihoods experience significantly higher consumption expenditure per adult equivalent, lower probability to be under poverty line, poverty gap as well as poverty squared gap. Therefore, rural livelihood diversification (off-farm and on-farm) could be recommended as a strategy to enhance household welfare through absorbing excess labor, and reduce the probability to fall under poverty. In recent times, land less young rural generation needs greater attention from policy makers and alternative livelihood meanness with practical skill training should be appropriately designed and implemented.
6. A household who accessed to either formal or non-formal credit has significantly higher consumption expenditure per adult equivalent, lower probability to fall under poverty and poverty gap as well as severity. This result provides clear insight on importance of rural credit service for poverty reduction, while FGD participants of PPA provide less importance for formal credit services. Therefore, existing rural credit services should be strengthened through provision of technical capacity support on business management beyond mere distribution of loan. Credit schemes should be diversified to address vulnerable community groups as well as the land less rural youths in order to start on and off-farm business. Besides, the study clearly reveals that, non-formal credit systems (in kind loan, loan from neighbors and relatives) have a significant importance not only to reduce poverty but also serve as copping mechanism to reduce household's suffer at times of resource limitation. Keeping in mind further investigations could be necessary to examine the role of non-formal credit

system on poverty reduction, development policy makers should provide due attention to non-formal credit schemes.

7. Cooperative services such as improved seeds, fertilizer and other agricultural inputs significantly determine the probability of households to fall under poverty line, poverty gap and squared gap. As a result, expanding cooperative services along with ensuring the quality could be considered as fundamental step to reduce the incidence, depth and severity of poverty in the study area.
8. The recent service, health extension, is found to be a significant determining factor to increase household consumption expenditure; reduce poverty status, depth and intensity. This finding is also highly supported by PPA, where FGD participants provide high score for health status of the household as determining factor of poverty. It is also imperative to link the focus of health extension on prevention and primary care services with the production efficiency of households. Henceforth, extending efforts to address poor community groups and ensuring quality health extension services should be emphasized in order to enhance household welfare and reduce incidence, depth and intensity of poverty.
9. Though there is high coverage 84.3%, agricultural extension service is insignificant to determine consumption expenditure per adult equivalent, poverty status, depth and severity in the study area. This result also repeated in PPA assessment. This is a clear indication that agricultural extension service provision lacks efficiency which could be linked with designed approaches or skills and capacity of extension personnel. Accordingly, extension approach revision could be required in order to come up with significant result towards poverty reduction efforts.
10. Finally, examining poverty using alternative assessment approaches enable to have deep insight on the perception and situation of poverty in the study area. Due to the complicated nature of poverty, it is recommended to utilize more than one measurement techniques in order to have clear insight and understanding about situation of poverty in a given community. Subjective poverty measurement approaches like participatory poverty assessment are recently evolved and rarely used alternatives which need further research and investigation.

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Appendices:-

Appendix 1:- Food poverty line derivation at current market price
(Using the lower 50% of households in terms of consumption expenditure)

Code	Food types	Mean daily amount of consumption per adult equivalent (A)	Calorie value/ 1 gm (B)	Total calorie of daily consumed food per adult equivalent (A*B)	Scaling up & down (2,300 Kcal/2,262.40Kcal) (C)	Adjusted mean amount of consumption per adult equivalent per day (A*C=D)	Median price (E	Daily consumption expenditure per adult equivalent (D*E)
101	Teff	0.132	3.41	449.60	1.02	0.134	15.50	2.08
102	Barley	0.082	3.54	290.70	1.02	0.083	10.00	0.83
103	Wheat	0.077	3.51	269.04	1.02	0.078	7.50	0.58
104	Maize	0.084	3.62	304.22	1.02	0.085	6.20	0.53
105	Engedo	0.062	3.41	210.25	1.02	0.063	6.00	0.38
106	Sorghum	0.028	3.47	95.61	1.02	0.028	10.71	0.30
112	Lentils(mesir)	0.006	3.70	20.72	1.02	0.006	46.50	0.26
113	Bean/bakel	0.027	3.44	91.51	1.02	0.027	20.00	0.54
115	Chick peas	0.057	3.41	193.73	1.02	0.058	28.00	1.62
116	Guaya	0.038	3.47	131.10	1.02	0.038	25.00	0.96
126	Salt	0.008	0.00	0.00	1.02	0.008	4.75	0.04
127	Berbere	0.006	3.18	20.35	1.02	0.007	65.00	0.42
128	Cooking oil	0.005	8.84	47.78	1.02	0.005	72.00	0.40
129	Onion/key	0.014	0.42	5.81	1.02	0.014	7.75	0.11
130	Garlic/nech	0.007	1.49	10.74	1.02	0.007	29.00	0.21
141	Coffee	0.003	0.02	0.07	1.02	0.003	77.50	0.27
143	Sugar	0.006	3.87	22.07	1.02	0.006	22.50	0.13
148	Potato	0.016	0.87	13.96	1.02	0.016	6.00	0.10
149	Tomatoes	0.009	0.70	6.62	1.02	0.010	10.00	0.10
154	Cabbage	0.014	0.17	2.45	1.02	0.015	8.80	0.13
158	Orange	0.003	0.32	0.98	1.02	0.003	15.48	0.05
166	Milk/yogurt	0.009	0.39	3.48	1.02	0.009	12.00	0.11
168	Butter	0.003	7.16	23.47	1.02	0.003	140.00	0.47
169	Beef meat	0.006	2.35	13.05	1.02	0.006	120.00	0.68
171	Chicken	0.007	1.40	10.49	1.02	0.008	90.00	0.69
172	eggs	0.003	0.68	2.01	1.02	0.003	50.00	0.15
173	Honey	0.008	2.90	22.62	1.02	0.008	105.00	0.83
	Total	0.720		2262.40		0.732		12.95

Source: Computed from own survey, 2020

Appendix 2:- Energy content per 100 gm of edible portion of food items.

Food types	**Kcal/100 gm.**		**Food types**	**Kcal/100 gm.**		**Food types**	**Kcal/100 gm.**
Teff	341		Guaya	347		Tomatoes	70
Barley	354		Salt	0		Cabbage	17
Wheat	351		Berbere	318		Orange	32
Maize	362		Cooking oil	884		Milk/yogurt	39
Engedo	341		Onion/key	42		Butter	716
Sorghum	347		Garlic/nech	149		Beef meat	235
Lentils(mesir)	370		Coffee	2		Chicken	140
Bean/bakel	344		Sugar	387		eggs	68
Chick peas	341		Potato	87		Honey	290

Source: FAO's Food Composition Tables for International Use -www.fao.org/docrep/x5557e/x5557e04.htm

Appendix 3:- Calorie Based Nutrition Adult Equivalence Scales.

Years of age	Male	Female		Years of age	Male	Female
0-1	0.33	0.33		12-14	0.96	0.84
1-2	0.46	0.46		14-16	1.06	0.86
2-3	0.54	0.54		16-18	1.14	0.86
3-5	0.62	0.62		18-30	1.04	0.80
5-7	0.74	0.70		30-60	1.00	0.82
7-10	0.84	0.72		60+	0.84	0.74
10-12	0.88	0.78				

Source: Adopted from Dercon and Krishnan (1998).

Appendix 4:- TLU conversion factor for different animals.

Animal Category	TLU	Animal Category	TLU
Cow & Ox	1.00	Donkey (adult)	0.70
Horse & mule	1.10	Donkey (young)	0.35
Camel	1.25	Sheep and Goat (adult)	0.13
Heifer & bull	0.75	Sheep and Goat (young)	0.06
Calf	0.25	Chicken	0.013

Source: Adopted from Yilma (2005)

Appendix 5:- Determinants of consumption expenditure per adult equivalent (OLS regression model).

Explanatory variables	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Household size	-.1307595	.0162267*	-8.06	0.000	-.1627368	-.0987822
Sex of hh head	-.0252508	.0694147	-0.36	0.716	-.1620435	.111542
Age of hh head	.0021304	.0017984	1.18	0.237	-.0014137	.0056745
Education of hh	.0085055	.0118494	0.72	0.474	-.0148456	.0318566
Dependency ratio	.0343067	.0947811	0.36	0.718	-.1524744	.2210879
Land size/ad.equiv	.1704005	.0806559**	2.11	0.036	.0114552	.3293457
Crop shared in culti. lan	.0749999	.0433234***	1.73	0.085	-.0103756	.1603755
Livestock (TLU)	.0362616	.0111434*	3.25	0.001	.0143018	.0582214
Farm impl. &hhdura.	.0000408	.0000196**	2.08	0.039	2.1306	.0000795
Access to credit	.1339307	.0466494*	2.87	0.004	.0420006	.2258608
Distance to market	-.0030816	.0046557	-0.66	0.509	-.0122564	.0060932
Access to cooperatives	.2027641	.0859991**	2.36	0.019	.0332892	.372239
Education of hh spouse	.0162676	.0579132	0.28	0.779	-.0978596	.1303947
Additional livelihood	.2441573	.0600929*	4.06	0.000	.1257347	.3625799
Access to irrigation	.11554	.0500176**	2.31	0.022	.0169724	.2141077
Access to health extes.	.168953	.0727206**	2.32	0.021	.0256456	.3122604
Freq. of agri.ex.vist	.0014209	.0057676	0.25	0.806	-.0099451	.0127869
Agro-ecology	-.2430403	.0411128*	-5.91	0.000	-.3240596	-.1620209
		.0162267	-8.06	_cons	-.1307595	-.0987822
Number of obs =242		F(18, 223) = 24.47Prob> F = 0.00000 R – squared = 0.5488Root MSE = 0.33177				

Source: Computed from own survey, 2020. *, ** and *** significant at 1%, 5% and 10% respectively

Appendix 6:- Determinants of poverty status of households (Logit regression model).

Explanatory variables	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Household size	.5758916*	.1464423	3.93	0.000	.28887	.8629132
Sex of hh head	-.6786391	.6202848	-1.09	0.274	-1.894375	.5370968
Age of hh head	-.034031***	.018969	-1.79	0.073	-.0712096	.0031476
Education of hh	-1.163648**	.4966259	-2.34	0.019	-2.137017	-.190279
Dependency ratio	.8875007	.9161346	0.97	0.333	-.9080902	2.683092

Land size/ad.equiv	-.6258377	1.183463	-0.53	0.597	-2.945382	1.693707
Crop shared in culti. lan	-.7006525	.4686033	-1.50	0.135	-1.619098	.2177932
Livestock (TLU)	-.1179326	.8110891	-0.15	0.884	-1.707638	1.471773
Farm impl. &hhdura.	-.0002898	.0002331	-1.24	0.214	-.0007467	.000167
Access to credit	-1.351955*	.4578411	-2.95	0.003	-2.249307	-.4546033
Distance to market	-.0049304	.0339623	-0.15	0.885	-.0714952	.0616345
Access to cooperatives	-2.13073*	.689616	-3.09	0.002	-3.482352	-.7791074
Education of hh spouse	-.1238893	.1389141	-0.89	0.372	-.3961558	.1483773
Additional livelihood	-1.594142*	.5254667	-3.03	0.002	-2.624037	-.5642456
Access to irrigation	-.9588398**	.4342473	-2.21	0.027	-1.809949	-.1077307
Access to health extes.	-1.671546**	.7859696	-2.13	0.033	-3.212018	-.1310741
Freq. of agri.ex.vist	-.0661058	.0942567	-0.70	0.483	-.2508456	.118634
Agro-ecology	1.64881*	.3694091	4.46	0.000	.9247811	2.372838
_cons	1.189828	1.854593	0.64	0.521	-2.445107	4.824764
Log likelihood = -95.175562			Number of obs = 242 LR chi2(18) = 123.38 Prob> chi2 = 0.0000Pseudo R2 = 0.3933			

Source: Computed from own survey, 2020. *, ** and *** significant at 1%, 5% and 10% respectively

Appendix 7:- Determining factors of poverty depth (Tobit regression model).

Explanatory variables	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Household size in number						
Sex of household heads	.0810749	.0136559	5.94	0.000	.0541645	.1079853
Age of household heads	-.0533787	.0641674	-0.83	0.406	-.1798277	.0730703
Education status hh	-.0036854	.0016003	-2.30	0.022	-.006839	-.0005318
Dependency ratio	-.0113396	.0115006	-0.99	0.325	-.0340028	.0113236
Land holding per adult equi	.0793818	.0975169	0.81	0.416	-.1127861	.2715496
Crop shared in land	-.065343	.1173979	-0.56	0.578	-.2966885	.1660025
Livestock (TLU)	-.0843339	.0507342	-1.66	0.098	-.1843113	.0156436
Farm implements & hh durable per adult equiv	-.015805	.007232	-2.19	0.030	-.0300563	-.0015536
Access to credit service	-.0000356	.0000271	-1.31	0.192	-.000089	.0000179
Distance to market (Km)	-.1683658	.0437934	-3.84	0.000	-.2546655	-.082066
Access to coop. services	.0005757	.0037751	0.15	0.879	-.0068635	.008015
Education status of household head spouse	-.1471924	.0523791	-2.81	0.005	-.2504112	-.0439736
Additional livelihood	-.1102483	.0710868	-1.55	0.122	-.2503327	.029836
Access to irrigation	-.1629608	.0626344	-2.60	0.010	-.2863889	-.0395328
Access to health extension	-.1250035	.0444585	-2.81	0.005	-.2126139	-.0373931
Frequency of agriculture extension visit	-.1805058	.070702	-2.55	0.011	-.319832	-.0411796
Agro-ecology	-.0122691	.0076687	-1.60	0.111	-.0273812	.0028429
_cons	.2446066	.037257	6.57	0.000	.1711876	.3180256
/sigma	-.1252261	.1732259	-0.72	0.470	-.4665869	.2161347
Log pseudo likelihood = -48.296727 157 left-censored observations at pgap1<=0 85 uncensored observations 0 right-censored observations			Number of obs = 242 F(18, 224) = 11.74 Prob> F = 0.0000 Pseudo R2 = 0.6029			

Source: Computed from own survey, 2020.

Appendix 8:- Determining factors of poverty severity (Tobit regression model).

Explanatory variables	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Household size in number	.0407219	.0071593	5.69	0.000	.0266137	.0548302
Sex of household heads	-.02484	.0282829	-0.88	0.381	-.0805746	.0308945
Age of household heads	-.0015715	.0007071	-2.22	0.027	-.002965	-.000178

Education status of hh	-.0045029	.0054143	-0.83	0.406	-.0151723	.0061665
Dependency ratio	.0140418	.0448836	0.31	0.755	-.0744063	.1024898
Land holding per adult equi	-.0366539	.0547863	-0.67	0.504	-.1446164	.0713085
Crop shared in land (hectare)	-.0359448	.0235398	-1.53	0.128	-.0823325	.0104429
Livestock (TLU)	-.0085519	.0035037	-2.44	0.015	-.0154564	-.0016475
Farm implements & hh durables	-.0000159	.0000123	-1.30	0.196	-.0000401	8.27e-06
Access to credit service	-.0739764	.0203317	-3.64	0.000	-.1140423	-.0339106
Distance to market (Km)	-.0002178	.0016884	-0.13	0.897	-.0035449	.0031094
Access to coop. service	-.0558532	.0238947	-2.34	0.020	-.1029403	-.008766
Education status of hh	-.0509132	.0313477	-1.62	0.106	-.1126873	.010861
Additional livelihood	-.0734565	.0290465	-2.53	0.012	-.1306958	-.0162172
Access to irrigation	-.0628613	.0199688	-3.15	0.002	-.102212	-.0235106
Access to health extension	-.0818708	.0315737	-2.59	0.010	-.1440903	-.0196513
Frequency of agriculture extension visit	-.0058891	.0037503	-1.57	0.118	-.0132794	.0015013
Agro-ecology	.1118522	.0191148	5.85	0.000	.0741843	.1495201
_cons	-.0853345	.0807484	-1.06	0.292	-.2444581	.0737891
/sigma	.1014349	.0092375			.0832314	.1196384
Log pseudo likelihood = 25.734964 157 left-censored observations at pgap2<=0 85 uncensored observations 0 right-censored observations			Number of obs = 242 F(18, 224) = 6.82 Prob> F = 0.0000 Pseudo R2 = 1.5554			

Source: Computed from own survey, 2020. *, ** and *** significant at 1%, 5% and 10% respectively.