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Effect of Household and Environmental characteristics on the household welfare: (In the case of Soro Woreda, SNNPR, Ethiopia)

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Abstract: The present study is aimed to analyze the effect of household and environment characteristics on the household welfare or poverty using primary cross-sectional data collected from six Kebeles of Soro Woreda over the sample of 251 households for the time period 2014/15. In empirical analysis researcher used the descriptive statistics to compare poverty indices (FGT poverty indices) of group of household along with household and environment characteristics and the econometric approaches (OLS and Probit regression model) to look into impact and to link with probability of being poor. Based on the analysis, this study found that the household characteristics such as household size and dependency ratio are found to be significantly and negatively affects the welfare of household whereas education, landholding and literacy ratio has a positive effect. Regarding environmental characteristics, household residence in Weina Dega and household having good soil and flat farmland has less likely of being worsened than their counterpart. Finally, the researcher mainly recommend that efforts should be made to improve possible characteristics like working more in education, family planning, and on practicing agro-ecological farming system to adopt ongoing environmental condition and to keep environment degradation in order to alleviate poverty.

Key words*:* Household characteristics, Environmental characteristics, welfare, poverty, FGT poverty indices, effect, OLS and Probit.

Introduction

Welfare' is a broad concept referring to the state of living of an individual or a group and interacts with environmental, economic and social contents (Pigou, 1932)[1]. Poverty indicates absolute or relative welfare deficiency encompassing economic, social, political, environmental and institutional perspectives. Poverty is a lack of basic human needs, such as adequate and nutritious food, clothing, housing, clean water, and health services. In its most extreme form, poverty can cause terrible suffering and death. The incidence of poverty is determined by wide range of demographic, economic, social and environmental issues that operates at household as well as national levels (OECD, 2003 and WB, 2007&2012). Ascertaining the socio-economic characteristics of the poor, and the constraints they face, is a prerequisite for effective policy design and the achievement of development goals (Ravallion, 1993)[2]. The study helps as guideline for decision and policy makers of concerned body who engage in social welfare improvement program. It also helps as: further reference for other researcher who interested on this issue in this particular study area or in other area; designing appropriate interventions; assessing effectiveness of on-going policies and strategies.

The study was absolutely focused on resident household of *Soro Woreda.* It is also limited to capture all characteristics of environment due to lack of detailed satellite-based environmental characteristics in this study area and difficulties of deep observation by the researcher at limited dispose. To put off the defect due to these, researcher would select the relevant variables. In this study all welfare indicators are not included in the analysis, but include the most welfare indicator that is household consumption expenditure (According to Ravallion, 1995)[3]. The hypothetical nature of the questions used in the survey may pose problems since respondents may have little incentive to provide their true characteristics. However, the data generated in the survey is used with much care to minimize such problem and the small sample bias.

Background of Study Area

Soro is one of the 365 *Woredas* of Ethiopia in the Southern Nations, Nationalities and Peoples' Region (***SNNPR***). Part of the *Hadiya* [4]Zone, Soro is bordered on the south by the *Kembata Tembaro* Zone, on the southwest by the *Dawro* Zone, on the west by the *Omo* River which separates it from the *Oromia* Region, on the north by *Gomibora*, on the northeast by *Limo*, and on the southeast by *Duna. Soro woreda* has currently 46,333 households (ARDOSW, 2015) and total population of 210,514 people living in 46 rural Peasant Associations (PAs) (*kebele*) and 3 rural towns, where 19 of the PAs which are adjacent to the Gibe River are dominantly pastoral and agro pastorals (CSA, 2010). The minimum and maximum sizes of households were 2 and 25 respectively, the average being 8.2 (CACC, 2003).

The 894 sq.km of the area of Soro is classified as midland (W*eina dega)* (51%), highland (*Dega)* (20%) and lowland (*Kola)* (29%) [5]agro ecological zones. Due to hilly topography most of the rain water is wasted as runoff and lot of soil erosion also occurs as the land is being cultivated in this period. Dominantly growing crops in the *Woreda* include potato, maize, wheat, *teff,* sorghum, barley, Oat, bean and peas in descending order according to the amount of production. Inset is the major food source for human and used as animal feed, medicine, mat, rope, fence, cosmetics, umbrella, home, fire wood, and source of income (CSA, 2010).

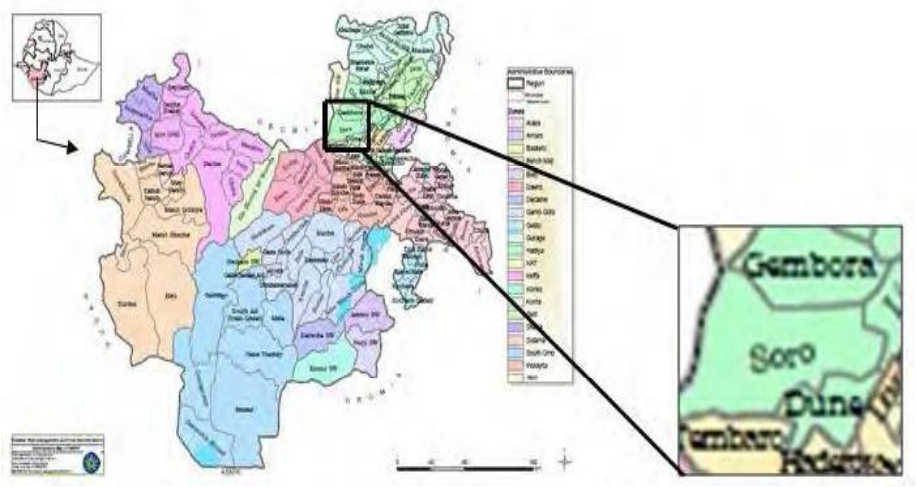
From total of 57,141 hectares of agricultural land 35% is flat and 65% is undulating, moderately sloping and hill lands. The wide diversity in climate, topography and vegetation cover in *Soro* has given rise to marked variations in soils quality, even within relatively small area. Although detailed soil surveys have not been carried out in *Soro woreda* the dominant soil types, as farmers' and soil experts' classification, are red-brown and red clayey soils on undulating land to steeping lands including the rolling plateau (SW and SNNPR ARD Offices, 2011).

Methodology

Data Source, Type and Collection Methods and Tools

The study mainly depends on primary cross-sectional qualitative and quantitative type of data for the time period of 2014/5. The main source of data was rural dweller household in Soro Woreda, ARDOSW and FEDOSW. Thus secondary data could be implemented

from these offices' relevant documents in the description. In order to collect both characteristics (households and environmental characteristics) of the same households that they face at their residence the researcher employed two step data collection.



Source: Disaster Risk Management and Security Sector Information Management (2010) ; Figure 3.2 Map of SNNPR, Ethiopia (Showing *Soro Woreda*)

First household characteristics would be obtained through structured household survey questionnaire, which was first prepared in English and then translated into Amharic, with the help of 21 enumerators. Second, after the questionnaires filled and turn back the researcher refer to and collect the environmental characteristics of each household from ARDOSW based on the village (*Mender)* and kebele that they filled on the questionnaire. This is because households may not know about environmental characteristics. In addition, the researcher also directly observes the environmental characteristics of some village that they put on the questionnaire with some expert.

Sampling Design, Technique and Sample Size

Regarding the sampling design *Soro woreda* was selected purposively as the study area from researcher point of view. Once the survey area would be selected, the simple random sampling was used to select two *Kebeles* from each of three Agro-ecological zones of *woreda* from which minimal sample size of 252 households are estimated from total of 4399 households of six *Kebeles* (Named Arara, Denta, Burre, Shera, Gidachamo and Fenta) using the following formula via online sample-size-calculator (http://www.surveysystem.com/index.htm). To execute that the researcher imaginary allow 6% margin of error or deviation of survey result for the sample

and chooses the 95% level of confidence in which actual population representation lies within the boundaries of negative and positive deviation (margin of error). The formula used in the sample-size-calculator is:

$$SampleSize = \frac{(Z-score)^2.SD(1-SD)}{(ME)^2} \quad \text{.....(1)}$$

Where, Z is tabulated value of normal distribution at 95% level of confidence; SD is Standard deviation and ME is Margin error. Moreover, taking in to account the factors that affect response of household and the need to obtain complete filled questionnaires of specified sample the researcher estimated response rate of 96% and therefore based on this estimation the total sample size of household was increased to 262. To allocate this sample size to each of six Kebeles population proportion sampling method would be employed due to difference in household number in each Kebeles using the following formula.

$$SS_j = \frac{(SS)(N_j)}{N} \quad \text{..... (2)}$$

Where SS_j = Sample size of j^{th} Kebele, j=1, 2 ...6

SS = Total sample size of all six Kebele

N_j = Household number of j^{th} Kebele, j = 1, 2 ...6

N = Household number of all of six Kebeles

Then simple random sampling methodvalued at 2014/15 national average prices would be used to select each sample sizein order to obtain food poverty line of from each Kebeles.

Setting Poverty Line

Both the food and total poverty lines that are used in this study are adopted from MoFED, 2011 and deflated at 2014/15 (study time) price level. These national poverty lines were set using the commonly used cost of basic needs (CBN) approach based on the data from 1995/96-2010/11 HICES by CSA. In Ethiopia, this method applied in the context of the 1995/96 Poverty Analysis Report. This was based on the cost of [6]2,200 kcal per day per adult food consumption with an allowance for essential nonfood items. To compute current poverty line groups of consumption items defined in 1995/96 that generate 2200 kilo calories are 2014/15. Then this food poverty line is divided by the food share of the poorest 25 percent of the population (0.525) to arrive at the absolute poverty line for year 2014/15. The food and total poverty lines for 2014/15 are determined to be Birr 2120.9 and 4038.8, respectively.

FGT Poverty Indices

Though there are a lot of methods to measure poverty of a group, the popular one is the Foster-Greer-Thorbecke's (FGT) weighted poverty index. FGT class of poverty indices is used to obtain and compare incidence, depth and severity of poverty of group of household along with different household or environmental characteristics. The FGT class of poverty measure is given as:

$$p_\alpha = \frac{1}{N}\sum_{i=1}^{n}\left(\frac{Pl - y_i}{Pl}\right)^\alpha \quad \text{..... (3)}$$

Where; α is poverty aversion parameter

N is total number of group of household having the same household or environmental characteristics;

Y_i is per adult consumption expenditure of i^{th} household;

n is number of poor household having the same household or environmental characteristics;

Pl is poverty line;

For each [7] $\alpha \geq 0$; if $\alpha = 0$, then P_0 is simply the headcount ratio (also called incidence of poverty). This implies that the share of the population whose income or consumption is below the poverty line, that is, the share of the population that cannot afford to buy a basic basket of goods. If $\alpha = 1$, P_1 is a re-normalization of the income-gap measure (also called poverty gap). This provides information regarding how far households are far from the poverty line. Lastly, if $\alpha = 2$, P_2 is sensitive measure (called severity of poverty). This takes into account not only the distance separating the poor from the poverty line (the poverty gap), but also the inequality among the poor, that is, a higher weight is placed on those households further away from the poverty line.

Description of Variables

The variables used in the analysis of study are generally grouped into two, household and environment variables. These variables or characteristics are proxies into four classes such as proxy for economic wellbeing, proxies for human capital, proxy for social capital and environment quality. Table 3.1 provides a description of the variables included in the analyses.

Econometric Models Specification

OLS Model

To interpret the effects of a unit change of exogenous determinants such as household and environmental characteristics and impact effects for dummy variables on household welfare, the researcher employed OLS regression. The ratio of household per adult expenditure to poverty line is used as the welfare indicator of household and is extensively used by many researchers (Hagos et al., 2002, Imran et al., 2009, Bolarin et al. 2009 and as cited in Imran et al. 2009 Ravallion (1996)). The following model is estimated using OLS. Let welfare indicator (W_i) is given by the ratio of household per adult expenditure (PAE_i) to poverty line (*Pl*) of i^{th} household.

That is $$W_i = \frac{PAE_i}{Pl} \quad \text{.....(4)}$$

Thus, OLS regression is given as

$$Log(W_i) = \beta_0 + x_i\beta_i + u_i \quad \text{.....(5)}$$

Where Log(W_i) is the logarithm of per adult consumption expenditure divided by poverty line is used as dependent variable and welfare indicator; β_0 is an intercept term; β_i and x_i are coefficients and set of exogenous determinants such as household and environmental characteristics respectively; u_i is an error term where u_i ~ N(0, σ^2).

Probit Model

In order to link household and environment characteristics with probability that household being poor the researcher used Probit model. In other word, the robustness of the determinants of welfare used in OLS is checked by estimating a probit model. Household per day per adult consumption expenditure levels will be used to classify households as poor or not poor based on poverty line set in above, as a proxy for welfare. The probit regression is estimated with the probability of a household being in poverty as the dependent variable and the identical set of independent variables used in the OLS regression. In this case the dependent variable is a dummy defined as:

Pov = 1 if the household is poor, 0 if otherwise..... (6)

Pr (*Pov* = 1/*X*) = *F*(*X*, β)

Pr (*Pov* = 0/*X*) = 1 – *F*(*X*, β),

Where, *X* is the vectors of the household and environment characteristics.

In other word *Pov* is poverty, =1, and β is the set of parameters showing the impact of changes in *X* on the probability of being poor.EMPIRICAL RESULTS

Out of total of 262 household in the survey 11 were incomplete or not well complete and therefore are excluded from the sample.

Descriptive Analysis

In table 4.2, observation for continuous variable is total observation and for discrete variable is frequency out of total observation. On the other hand, mean of discrete variable indicate the percentage of that variable from the total sample observation.

Poverty Estimate of Household of Soro Woreda

Before going to discuss the effect of household and environmental characteristics on household poverty, it necessary to present the estimate of household poverty in Soro using FGT indices based on the data collected through survey questionnaire. The estimated poverty measures are given in table 4.3. Accordingly, the result shows that 37.6% of households are poor in this study area. The poverty depth is about 12% which mean that 12% of the poverty line is required to run away from poverty. The severity of poverty is estimated at 5.3%, implying that there is 5.23% inequality among the poor. On the other hand, this indicates that how much of a gap is among the poor and what volume of resources is needed to bring these households closer to the poverty line or above it.

Characteristics

Each of the poverty indices in the table below were obtained by using FGT poverty indices formula. In the tables, percentage of poor form poor implies the ratio of poor within specific group of household to total poor household in the sample while percentage of household implies ratio of household of specific

group to total of sample household. Poverty incidence, depth and severity are implies percentage of poor; required percentage of poverty line to escape from poverty; and percentage of inequality among poor respectively within particular group of household.

Generally, the decomposition of poverty indices by household and environmental characteristics, in the table 4.4 blow, has demonstrated that incidence, depth and severity of poverty in Soro is slightly decreases as increase in age of household head, landholding size, literate ratio and education level and decrease in dependency ratio, female ration and household size. The description also shows that there is high incidence, depth and severity of poverty among household with female headed, non-out-migrant member, polygamous, illiterate headed compared to household with male headed, out-migrant, monogamous and literate headed respectively. Decomposition results showed that there were considerable differences in poverty indices along with environmental characteristics. In this regard, household reside in *Weina Dega*/midland agro-ecology zone and in the village with flat farmland and relatively good soil quality have low poverty indices than household reside in lowland or/and highland and in the village with slopped farmland and relatively low soil quality respectively.

Econometric Analysis: The two econometric approaches, OLS and probit models, have been adopted. All of the variables or categories analyzed in the description are not included in the Econometric models because of co-linearity and small ratio bias. Before estimation was done; dropping and transforming the variables were applied as the remedial for highly correlated variables (multicolinearity problem) and STATA command robust was used to resolve the problem of heteroscedasticity.

Effect of Household and Environmental Characteristics on Household Welfare Indicator in Soro Using OLS Regression

Here household welfare function (proxied by the ratio of per adult expenditure to poverty line) is estimated using ordinary least square model. The resulting estimates are presented in table 4.5. Since the model is in the log-linear form, a convenient interpretation of the model is a one unit increase (or discrete change for dummies) in the independent variable (household and environmental characteristics) leads to a percentage change in household welfare indicator equivalent to the estimated regression coefficient of the independent variable. The joint or overall test of significance, F-test, is accepted at the 1% level of significance in the OLS equation having the hypothetically correct signs of all variables. The fit of the model is good, with R-square 0.60 implying that an average of 60% of the variation in the dependent variable is due to these explanatory variables and the remaining 40% is due to other unmentioned variables.

Household and Environmental Characteristics Implications on Probability of Being Poor in Soro Using Probit Model

In this case the dependent variable is binary *(Pov:* poor =1, non-poor =0) and the poverty line used to separate the poor from the non-poor is 4038.8 birr. This is an updated poverty line at 2014/15 price

indices based on national poverty line of 3781 birr in 2010/11 as established by the MoFED. Since being a poor household = 1, a positive coefficient of the independent variable indicates an increase in the probability of being poor and vice versa.

For the estimates of the probit model, the chi-square statistic of the Likelihood Ratio shows the overall model as a good fit. In this regard, probit result shows that the coefficient for household size is positive and significant, indicating that larger household member has greater probability of being in poor at 1% significance level. Higher dependence ratio (higher proportions of household members who are children and elderly compared to adult age) in the household significantly increase the probability of the household to fall into poverty at 1% level of significance.

Age of the household head has significantly decreases the likelihood of the household being poor at 10% level of significance showing that a year increase in age of HHH decreases the probability that household being poor by 0.02 at 1% significance level while age square insignificantly increases the probability of being poor. The coefficients of education dummies are significant at the 1% and 10% level of significance. The output of probit regression shows that household with head attaining primary & secondary education and grade 12 & above has reduce probability of being poor compared to household with alliterated head. The conventional interpretation implies that a discrete change of household with illiterate head to household with head attaining grade 12 and above education the probability of household being poor is approximately decreased by 0.36 at 1% significance level.

As to the environmental variable, table 4.6, in the above, shows that household live in lowland agro-ecological zone has positively and significantly related with the probability of being poor relative to those household live in highland agro-ecological zone implying that a discrete change in location of household from highland to lowland increase the probability of falling below poverty line approximately by 0.19 at 10% significance level. In contrast, the discrete change in location of household from highland to *Weina Dega* agro-ecological zone decreases the probability of household being poor approximately by 0.1.

The remaining variables such as sex, sex ratio, literacy ratio, landholding size, marital and employment status of household, among household characteristics, are found to be insignificant factors in affecting likelihood of household being poor. But the hypothetical or expected sign of coefficients for each of these variables are found to be much similar and consistent with result of OLS and descriptive analyses. For example, increase in literacy ratio and landholding size of household would result in decrease in likelihood of poverty. Among environmental characteristics, as table 4.6 shows, both landform and soil quality, consistent with OLS, does not have much significant influence on probability of being below poverty line. But the sign of coefficient indicates that households having flat and fertile soiled farmland in the village are less likely of being poor than household having slopped and poor soiled farmland in their village respectively.

In the probit regression, even though the effect of out-migration on probability of being poor not significant the sing of coefficient indicates that it is inconsistent with OLS regression as well as descriptive analysis. This is due to sensitivity of dependent variable under poverty line adopted in the case of probit. For this argument four possible factors would be presented in the main paper of this research.

Conclusion and Policy Implication

In developing countries like Ethiopia the relationship between economic reform, growth and poverty remains one of the most arguable policy questions. The studies like examining effect of household and environmental characteristics on the welfare serve as some reply for such policy questions because the ability of a household to exploit available economic opportunities is shaped by characteristics inherent to the household. This study analyzed the effect of household and environment characteristics on the household welfare using primary cross-sectional data collected from six Kebeles of Soro woreda over 251 household for the time period 2014/15 using descriptive and econometric analysis. Both descriptive and econometric analyses are fairly consistent up on the same conclusion and overall results are very robust to a different empirical approach.

The study found that households having flat farmland and relatively good soil quality in their village were found to be better off or more likely of welfare improvement or poverty reduction than household having sloped farmland and relatively poor soil quality in their *Mender* respectively. Based on this the following are recommended solutions to tackle this problem or to have better environmental quality for agriculture especially to keep soil.

- Structural measures like terraces, bunds, dams, cut off drains are recommended strategies to control run off, wind velocity and erosion for more sloped farmland.
- Agronomic practices like contour cultivation strip cropping, crop rotation, mulching, and residue and mixed cropping, construction of graded soil bund or graded *fanya juu* are recommended to maintain soil quality.
- Similarly, policies focused on conservation of wetlands and forests, improvement of grasslands (mainly pasture land) could be important policy issues to have better environment quality and then to insure the living standard of the societies.

An alternative policy recommendation to those poverty-stricken households resides in mountainous areas, stone mountainous areas, village with poor soil quality and no farmland, high temperate area with atrocious conditions were recommended to movement to other places.

Finally, even though the title of this research is needed multidimensional analysis it has limited scope and time coverage due to time and financial constraint. It depends on cross sectional data which infers the results of one time (2014/15) data that confronted to clearly investigate the real picture of implication of household and environmental characteristics on household welfare in Soro Woreda. Therefore, it is important to have panel data and continuous household surveys so as to have dynamic and robust implication of these variables

over the welfare of household. The study analyzed and reached an outcome based on 251 households from six *Kebeles* of Soro Woreda using descriptive statistics and OLS and Probit regression model. It is of the researcher's feeling that other studies should be carried on large study area having large sample and different environment characteristics (including bio-physical information); including other welfare indicator; and using additional econometric model

Table3.1: Description of Variables that used in analysis

Variable name	***Variable Description***
	Dependent variable
1. $Log(w_i)$ 2. *Pov*	Logarithm of the ratio of per adult consumption expenditure to poverty line of i^{th} household. Binary, 1 if the household is poor or per adult expenditure is below poverty line, 0 otherwise
	Independent variables
3. OutMig	1 if one or more of household members out-migrated and 0 if no one out-migrated.
4. HHHAg	Age of household head
5. HHHAgS	Age square of hhh (to introduce the non-linear relationship between age and the dependent variables)
6. HHHSex	Gender of household head; male= 1, female= 0
7. EmpGov	Household head employed in government sector.
8. EmpPri	Household head employed in any non-government/private (like church, etc) sector.
9. EmpSelf	If household head self employed 1, otherwise 0.
10. MonGam	Marital status household head is married (Monogamous).
11. PolGam	1 if marital status household head is married (Polygamous), 0 otherwise.
12. WDS	If marital status of household head is widowed, divorced, separated or unmarried.
13. HHHIli	1 if household head is illiterate/ no education, 0 otherwise.
14. PriEdu	Household head's maximum level of education is Grade 1-7.
15. SecEdu	Household head's maximum level of education attained is Grade 8-11.
16. PriSecEdu	1 if household head's maximum level of education is PriEdu and SecEdu, 0 otherwise.
17. HigEdu	1if household head's maximum level of education attained is Grade 12 and above, 0 otherwise.
18. HHSiz	Number of household member
19. DepRat	Ratio of dependent household members to working age household member. (i.e. (number of children + number of elderly)/number of working age adult)
20. LitRat	Ratio of literate household; number of literate member/household size
21. FemRat	Ratio of female household member; number of female/household size
22. LanSiz	Landholding size of household in hectare.
23. LowLan	1 if Household residence is in lowland area, 0 otherwise.
24. MidLan	1 if Household residence is in Midland (*Woina Dega*) area, 0 otherwise.
25. HigLan	1 if Household residence is in Highland area, 0 otherwise.
26. LEM	1 if the soil quality of household farmland is relatively high, 0 otherwise.
27. LEMTUF	The soil quality of household farmland is medium.
28. TUF	The soil quality of household farmland is relatively low.
29. Flat	1 if landform of households' agricultural land is flat, 0 otherwise.
30. MSlop	Landform of households' farmland is moderately sloped.
31. VSlop	Landform of households' farmland is very sloped and hilly.

Source: Self Computation

Among the set of potential determinants of poverty, an attempt is made to choose those variables that are possibly exogenous to consumption and the variables that are outcome of poverty, rather than determinant of poverty, are omitted from the analysis.

Table 4.2 Summary statistics of the data

Characteristics		Type	Observation	Mean	Std. Dev.	Min	Max
HH per capita Expenditure/year		Continuous	251	7523.1	7203.6	981.8	47092.4
HH Per adult Expenditure		Continuous	251	8855.98	8032.98	1342.6	54515.3
HH size		Continuous	251	8.27	2.28	4	17
Dependence Ratio		Continuous	251	0.64	0.43	0	3
Female Ratio		Continuous	251	0.484	0.188	.11	1
Age of HHH		Continuous	251	47.89	10.15	25	77
HHH Sex	Male head	Discrete	175	0.69	0.460	0	1
	Female Head	Discrete	76	0.30	0.46	0	1
Out-migrate Member	Yes	Discrete	102	0.40	0.492	0	1
	No	Discrete	149	0.59	0.49	0	1
HHH Education	No Education	Discrete	51	0.20	0.403	0	1
	Grade 1-7	Discrete	79	0.314	0.46	0	1
	Grade 8-11	Discrete	76	0.30	0.460	0	1
	Grade 12 and above	Discrete	45	0.179	0.38	0	1
Literacy Ratio		Continuous	251	0.72	0.273	0	1
HH Landholding size		Continuous	251	2.04	1.568	0.13	6.5
HHH Employment	Government Employed	Discrete	36	0.14	0.351	0	1
	Private/NGO employed	Discrete	13	0.052	0.22	0	1
	Self employed	Discrete	202	0.80	0.39	0	1
HHH Marital Status	Married/Monogamous	Discrete	175	0.69	0.46	0	1
	Married/Polygamous	Discrete	52	0.21	0.41	0	1
	Wind., Divor., unm& Separ	Discrete	24	0.096	0.29	0	1
Agro-ecological Zone	Highland	Discrete	82	0.33	0.46	0	1
	Weina Dega	Discrete	103	0.41	0.49	0	1
	Lowland	Discrete	65	0.25	0.44	0	1
Landform	Flat	Discrete	108	0.43	0.496	0	1
	Slopped	Discrete	95	0.38	0.486	0	1
	Very slopped	Discrete	47	0.187	0.39	0	1
Soil quality	LEM	Discrete	84	0.33	0.472	0	1
	LEMTUF	Discrete	141	0.562	0.49	0	1
	TUF	Discrete	26	0.104	0.30	0	1

Source: Own survey computation

Table 4.3 Poverty estimate of household of Soro Woreda

Poverty measures/indices	Poverty estimate	Stan. Error	95% Conf-Interval
Poverty incidence	0.37	0.031	(0.436, 0.315)
Poverty depth	0.12	0.020	(0.159, 0.079)
Poverty severity	0.053	0.0013	(0.055, 0.050)

Source: Calculated from own household survey

Table 4.4 Decomposition of household poverty by household and Environmental Characteristics

	Household and Environmental characteristics		% of poor from poor	% of household	Poverty incidence	Poverty depth	Poverty severity
Household Characteristics	**Household size**	4&5	0.06	0.06	0.4(0.126)	0.13(0.088)	0.054(0.023)
		6&7	0.18	0.33	0.20(0.044)	0.05(0.024)	0.02(0.003)
		8&9	0.34	0.33	0.38(0.052)	0.11(0.034)	0.046(0.004)
		10 and above	0.41	0.27	0.56(0.059)	0.2(0.048)	0.1(0.0058)
	Education level of HHH	Illiterate	0.37	0.20	0.68(0.064)	0.25(0.061)	0.12(0.008)
		Grade1-7	0.48	0.32	0.57(0.056)	0.17(0.042)	0.07(0.005)
		Grade 8-12	0.12	0.30	0.15(0.04)	0.02(0.018)	0.01(0.002)
		Grade ≥12	0.03	0.18	0.06(0.037)	0.03(0.024)	0.01(0.004)
	Dependence ratio	≤0.5	0.12	0.43	0.1(0.029)	0.02(0.013)	0.01(0.001)
		0.51-0.8	0.32	0.23	0.51(0.065)	0.14(0.045)	0.05(0.006)
		≥0.81	0.56	0.33	0.63(0.053)	0.23(0.046)	0.11(0.005)
	Female Ratio	≤0.4	0.18	0.27	0.25(0.053)	0.08(0.033)	0.04(0.004)
		0.41-0.6	0.42	0.42	0.38(0.047)	0.11(0.03)	0.048(0.003)
		≥0.61	0.39	0.31	0.48(0.057)	0.16(0.042)	0.07(0.005)
	HHH Sex	Female	0.48	0.30	0.59(0.056)	0.21(0.046)	0.09(0.005)
		Male	0.52	0.69	0.28(0.034)	0.081(0.02)	0.04(0.002)
	HHH Age	≤39	0.26	0.16	0.59(0.077)	0.2(0.063)	0.09(0.01)
		40-49	0.40	0.40	0.38(0.049)	0.11(0.032)	0.05(0.003)
		≥50	0.34	0.44	0.29(0.043)	0.09(0.028)	0.04(0.003)
	Landholding size	≤1.2	0.46	0.38	0.44(0.05)	0.16(0.037)	0.08(0.004)
		1.3-2.4	0.36	0.34	0.41(0.054)	0.11(0.035)	0.046(0.004)
		≥2.5	0.18	0.28	0.24(0.051)	0.065(0.03)	0.025(0.004)
	HHH Marital Status	Married(Monogamy)	0.61	0.70	0.33(0.035)	0.09(0.022)	0.04(0.002)
		Married(Polygamy)	0.30	0.21	0.54(0.069)	0.18(0.054)	0.08(0.007)
		WDS	0.09	0.09	0.38(0.099)	0.15(0.073)	0.07(0.015)
	HHH Employ't	Government	0.16	0.14	0.42(0.082)	0.13(0.056)	0.05(0.009)
		NGO Employed	0.08	0.05	0.62(0.135)	0.24(0.118)	0.12(0.033)
		Self Employed	0.75	0.81	0.35(0.034)	0.11(0.022)	0.05(0.002)
	Out-Migrate	Yes	0.37	0.41	0.34(0.047)	0.09(0.03)	0.04(0.003)
		No	0.63	0.59	0.396(0.04)	0.13(0.03)	0.06(0.002)
Env't Characteristics	**Agro-ecological Zone**	Highland	0.32	0.33	0.37(0.053)	0.11(0.034)	0.047(0.004)
		Weina Dega	0.24	0.41	0.22(0.041)	0.05(0.022)	0.02(0.002)
		Lowland	0.44	0.26	0.63(0.06)	0.24(0.053)	0.11(0.007)
	Landform	Flat	0.30	0.43	0.269(0.04)	0.09(0.024)	0.02(0.002)
		Slopped	0.38	0.38	0.37(0.049)	0.11(0.032)	0.045(0.003)
		Very slopped	0.32	0.19	0.638(0.07)	0.25(0.064)	0.132(0.009)
	Soil quality	LEM	0.19	0.33	0.21(0.045)	0.07(0.028)	0.037(0.003)
		LEMTUF	0.58	0.56	0.39(0.041)	0.11(0.027)	0.045(0.002)
		TUF	0.22	0.11	0.81(0.077)	0.299(0.09)	0.143(0.018)

Value in brackets is Standard Error
Source: Calculated from own household survey

Table 4.5 Result of OLS regression of welfare function

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Dependent variable: Log of ratio of per adult expd to PL:	**Coeff/t**
Dummy for one or more household member out-migrate	0.053***
	(1.7)
Household head Age in year	0.007
	(0.74)
Household head Age Square	-0.0001
	(-0.58)
Dummy for male household head	0.01
	(0.27)
Household Size	-0.04*
	(-6.3)
Dependence Ratio	-0.25*
	(-5.92)
Female Ratio	-0.08
	(-0.95)
Literacy Ratio	0.061
	(0.94)
Household Landholding Size	0.014
	(1.09)
Dummy for household head attain Primary and Secondary education	0.10**
	(2.55)
Dummy for household head attain grade 12 and above education	0.289*
	(5.19)
Dummy for Married household head /Polygamous	-0.01**
	(-2.18)
Dummy for Self-Employed household head	0.083*
	(2.73)
Dummy for Lowland residence	-0.01
	(-0.2)
Dummy for *Weina Dega* residence	0.056***
	(1.68)
Dummy for good soil quality/LEM	0.05
	(1.48)
Dummy for flat farm landform	0.035
	(1.14)
Constant	0.174
	(0.66)
Number of observation	251
R^2	0.60

**p< 0.01, ** p< 0.05, *** p< 0.1; t-values in the parentheses*
Test of joint significance; F (16, 234) = 21.69 p> F= 0.0000
Source: Computed from own household survey

Table 4.6 Result of Probit regression showing probability of being poor

Dependent variable: Pov=1(poor),=0 otherwise	Coeff/z	(dy/dx)/z
Dummy for one or more household member out-migrate*	0.06	0.02
	(0.28)	(0.28)
Age of household head	-0.05	-0.02***
	(-1.64)	(-1.65)
Household head Age square	0.003	0.0001
	(0.67)	(0.67)
Dummy for male headed household *	-0.01	-0.002
	(-0.03)	(-0.03)
Household size	0.22*	0.08*
	(4.15)	(4.12)
Dependence Ratio	1.11*	0.38*
	(4.16)	(4.07)
Female Ratio	0.4	0.14
	(0.72)	(0.72)
Literacy Ratio	-0.66	-0.23
	(-1.58)	(-1.57)
Household landholding size	-0.01	-0.002
	(-0.08)	(-0.08)
Dummy for HHH attain Prim. and Secon. education*	-0.45***	-0.16**
	(-1.81)	(-1.77)
Dummy for HHH attain grade 12 and above *	-1.53*	-0.36*
	(-3.72)	(-6.4)
Married household head/Polygamous*	0.12	0.04
	(0.5)	(0.49)
Dummy for self-employed household head*	-0.4	-0.14
	(-1.63)	(-1.57)
Dummy for Lowland residence*	0.51**	0.19***
	(1.86)	(1.78)
Dummy for Weina Dega residence*	-0.25	-0.08
	(-1.01)	(-1.02)
Dummy for good soil quality/LEM*	-0.21	-0.07
	(-0.85)	(-0.87)
Dummy for Flat farmland *	-0.22	-0.08
	(-1.02)	(-1.04)
Number of observation	251	251

Variables with (*) dy/dx is for discrete change of dummy variable from 0 to 1.

*Coefficients with *, ** and*** are p<0.01, p<0.05, and p<0.1respectively; z-values in the parentheses*
-log likelihood = 106.11; Wald chi-sq (16) =108.08 p>chi-sq=0.0000
Source: Calculated from own household survey.

References

[1] Pigou, A. C., (1932), "The Economics of Welfare," fourth edition, London: Macmillan.

[2] Ravallion, M. (1992), "Poverty comparisons: a guide to concepts and methods" World Bank, Washington DC

[3] Ravallion M. and Lanjouw P., (1995), "Poverty and Household Size," The Economic Journal, 105, 1415- 1434

[4] ***Zone*:** The third tier of government in the administrative structure of the Federal Democratic Republic of Ethiopia (FDRE) (MoFED, 2002).

[5] In Ethiopia Agro-ecological division has two facets, namely traditional and the elaborated agro-ecological zones. The traditional include Bereha (Hot lowlands of less than 500 masl), Kolla (lowlands between 500 & 1500 masl), Woina Dega (Midlands between 1500 & 2300 masl), Dega (highlands between 2300 & 3200masl), Wurch (highlands between 3200 & 3700) and Kur (highlands above 3700 masl) whereas elaborated agro-ecological zone are 33 (EIAR, 2011).

[6] With the standards set by WHO/FAO, the minimum calories requirements vary from country to country specified by age, gender, weight, environment and activity level.

[7] α is value (0, 1, or 2) that determine the degree to which the measure is sensitive to the degree of deprivation for those below the poverty line and higher values of α shows greater weight is placed on the poorest section of the society.