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Determinants of Rural Household Poverty Across Agro-Ecology in Amhara Region, Ethiopia: Evidence from Yilmana Densa Woreda

Birara Endalew* Kassahun Tassie
College of Agriculture and Environmental Sciences, Bahir Dar University

Abstract
In Ethiopia, poverty eradication is the central development agenda. Studies regarding to determinants of household poverty support the poverty reduction policies to bring sustainable development. The result revealed that the poverty head count ratio (62.3%), poverty gap (18.9%) and severity (5.8%) in Yilmana Densa woreda is higher than the national and regional rate. The model result revealed that educational status, cost of agricultural inputs, agro-ecology, and land and livestock ownership, saving culture and size of rented land were negatively and significantly related with household poverty. Whereas, family size, health status and inefficient labour force utilization were positively and significantly related with household poverty. The poverty head count ratio, gap and severity of Kola agro-ecology is higher than Dega and Woina-Dega agro- ecologies. Therefore, policy makers should design poverty reduction strategies based on agro-ecology difference to bring long lasting solution to household poverty which aims to bring sustainable development.
Keywords: poverty, binary logit, agro-ecology, farm household, development, sustainable

1. Introduction

Even though poverty eradication is the ultimate objective of development endeavours and policies in developing countries, the problem is pervasive, intensive, chronic and largely a rural phenomenon (Muleta & Deressa, 2014). That is why the world political leaders' rhetoric is many on poverty eradication even though the practical application faces multidimensional interests and problems (Woolcock & Narayan, 2000). The report of Rodrik (2007)indicated that rapid and sustained economic growth is critical to making faster progress for poverty reduction and improving the quality of life in developing countries which leads to human development. Similarly, Aigbokhan &Tayo (2017) explained that poverty reduction is one of the major development activities in developing countries which includes income poverty, malnutrition, mortality, illiteracy, social exclusion and vulnerability. The report of WB (2015a) on Millennium Development Goals indicated that extreme poverty has been declining in all regions of the world with the exception of Sub-Saharan Africa.

In Sub-Saran Africa, poverty reduction is challenging due to multiple causes of poverty (Chen & Ravallion, 2007; Dercon, 1999). Ethiopia, the second populous country in sub-Saharan Africa next to Nigeria, is also an example of hunger and poverty for many years in the world (WB, 2005). The report of UNDP (2011) shows that Ethiopia ranks 174th out of 187 countries based on human development index calculation, and the average per capita income of the country is less than half of the sub-Saharan average. Similarly, FAO (2010) reported that that 41% of the Ethiopian population lives below the poverty line and 31.6 million people are undernourished. According to the report of MOFED (2012), the proportion of poor people in Ethiopia is 29.6%. Although the trend of poverty is declining, still the problem is more persistent in rural Ethiopia (30.4%) as compared to urban areas (25.7%) (MOFED, 2012; Tesfaye, 2013). The study conducted by Moges (2013) reported that Ethiopia has a subsistence agriculture dominated economy and most of Ethiopians live in remote rural areas in chronic poverty. As a result, poverty reduction has been an important component of development activities which aims to trim down the prevalence of insidious poverty in the country (MOFED, 2012). To alleviate this problem, government policies could be effective and sustainable only when they are directed to address the underlying causes of poverty in the country(Moges, 2013). The low level of poverty head count ratio, gap and severity at national level is not a guarantee the intensity of poverty at household level. To bring sustainable solution for persistent poverty, policies should be designed and implemented based on empirical findings at national, regional, woreda and household level.

Amhara region is the lowest in terms of asset holding among the regional states of Ethiopia (MOFED, 2002). Even though the trend of poverty headcount ratio declined from 54.3% in 1996 to 30.5% in 2011, the numbers of poor people are still high as compared to the national head count ratio (29%) (WB, 2015b). In addition to this, the highest food poverty is observed in Amhara region (42.5%) followed by Tigray (37.1%) and Benehsangul Gumuz (35.1%) (MOFED, 2012; WB, 2015b). Yilmana Densa woreda is one of the 64 chronically food insecure woredas' of Amhara region. Different regional, national and international organizations have been working to alleviate the existence of pervasive poverty in the woreda (YDWPRO, 2016). Consequently, examining the causes of household poverty has great importance for the donors as well as the regional and national government to design and implement intervention mechanisms. The study conducted by Moges (2013) explained that the main impediments to poverty reduction in Ethiopia emerge from a complex web of interaction of economic, political, demographic,

social, geographic and institutional factors. To design and implement intervention strategies in the study area, the possible factors affecting household poverty needs to be identified. But studies regarding to poverty measurement and determinant analysis in Yilamana Densa woreda is total nil. As a result, this study was conducted to measure household poverty across agro-ecological zones using Cost of Basic Needs approach, to evaluate the level of household poverty using Foster Greer Thorbeck model and to analyze determinants of household poverty using binary logit model.

2. Materials and Methods

2.1 Description of the study area

The study was conducted in Amhara National Regional State (ANRS) in West Gojam Zone particularly at Yilmana Densa woreda. Yilmana Densa woreda is one of the 13 rural woreda of West Gojam Zone. The study area covered 1018.11km^2 of land and 43 km Northeast of Bahir Dar, the capital of Amhara regional state. The woreda constitute three agro-ecological zones: Dega, Woina Dega and kola. Kola and Dega parts of the woreda are more or less sparsely populated compared to Woina-Dega. The temperature ranges from 15-24 degree centigrade while the rain fall ranges from 1200 – 1600mm.

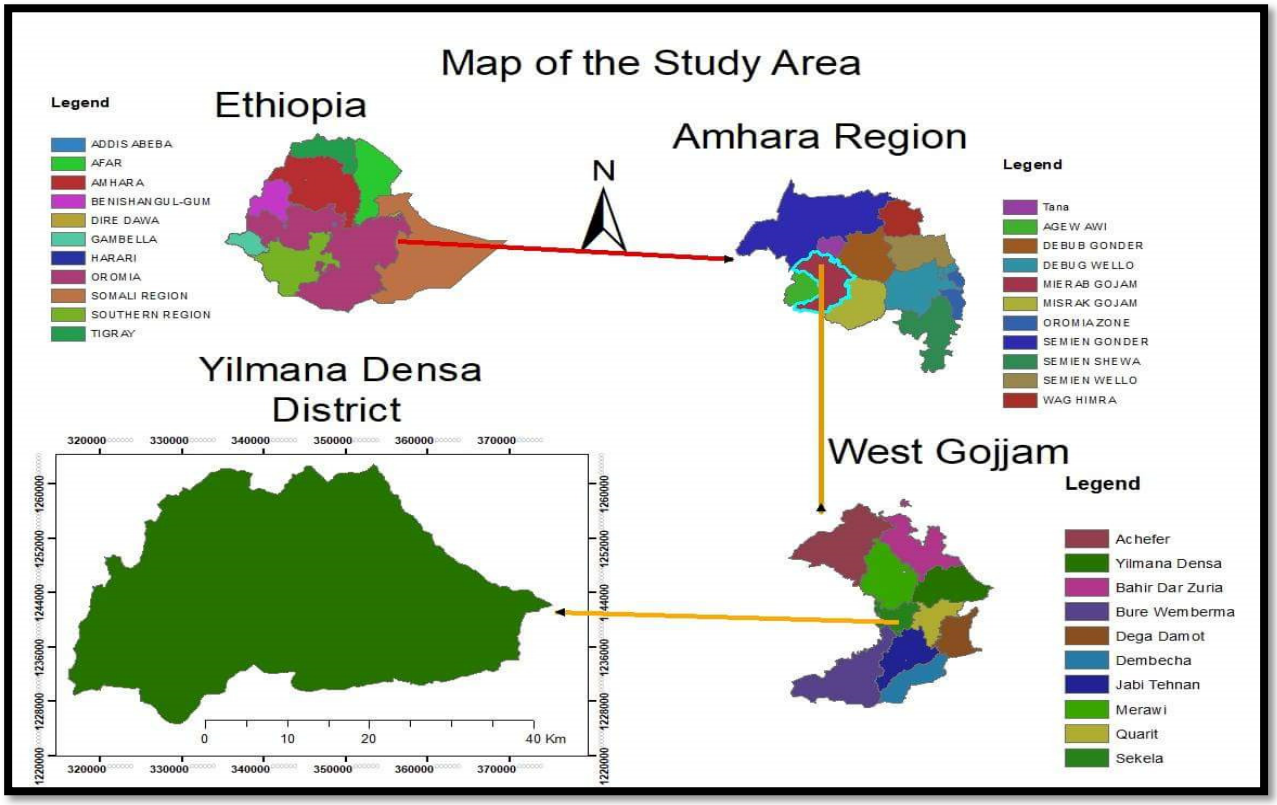

Figure 1: Map of the study area

Average annual rainfall of the area is 1437mm from this about 54% of the rainfall occur in July and August months, only 3% fall during the dry months. It is located between at15°37" North Latitude and at 37°25" East Longitude. The study area is one of the most populous areas in the ANRS with a population of 157,213 of which 49.7% are male and 50.3% female. The population of the woreda is predominantly rural with about 94.5 % living in rural and only 5.5% of the people living in urban areas (CSA, 2007).

2.2 Sampling Procedures

For the purpose of this study, stratified sampling technique was employed. To capture heterogeneity of the population, 37 kebeles of the study area were stratified based on agro-ecology to get representative samples from each stratum. The stratification process indicated that 6, 14 and 17 were Dega, Kola and Woina-Dega, respectively. From this, a total of 11 (2, 4 and 5) kebeles were selected from the three agro-ecological zones. This is mainly because these kebeles located in each stratum have homogenous characteristics with respect to proximity to each stratum group, with population density, availability of infrastructures and socio economic activities. Next to this, 328 households were allocated to the sample kebeles using probability proportional to sample size. Finally, systematic random sampling was applied to draw sample respondents from each stratum. The sample size would be determined by considering resource constraints and representativeness of the sample. A critical component of

sample size formula developed by Cochran (2007) was used to determine sample households for this study. The formula employed either pilot study results or previous studies result of the same or a similar population. The sample size was decided by using scientific statistical formula adopted from(Fox *et al.*, 2007).

$$n = \frac{NZ^2PQ}{d^2(N-1)+Z^2PQ} = 328 \text{----------} 1$$

Where: n = the total desired minimum sample size;
N = total population (157,213);
Z = standardized normal deviation at the required confidence level equals to 1.96;
d = allowable error which is equal to 0.05;
P = result of previous studies (**P**=0.69 and **Q** =1- P = 0.31).

2.3 Sources and method of data collection

According to Limb &Dwyer (2001) most of the time qualitative approach is essential for the data gathered through interviews, observations and document analysis. However, qualitative method is criticized because it is too subjective and containing too many variables and too few units and which is difficult for generalization. In contrast, quantitative approach is a structured way of collecting data. It is characterized by measurable data, which can be expressed through numbers and other quantifications. Quantitative methods are also criticized because it is too narrow and too positivistic in answering questions. Therefore, using a combination of qualitative and quantitative approach is better than any approach alone. In order to attain the objectives of this study, both qualitative and quantitative data were collected from both primary (using: structured /closed-ended/questionnaire for households; unstructured/open-ended questionnaire) and secondary (internet websites; previous research results; working and report papers; available books) sources. Finally, primary quantitative data were gathered from single farm households' survey of the 2017 cropping season.

2.4 Method of data aggregation

As Haughton &Khandker (2009) argued aggregation is a complex and necessary process in measuring poverty. Data aggregation is important for the following reasons:
1. Households of different size and composition have different needs and consumption level,
2. Differences in prices across regions and at different points in time/inflation indexes/ and
3. Exclude input and investment expenditures since it overstates the level of the actual household welfare. As a result, this study undertook data aggregation using adult equivalent/AE/ scale and livestock conversion factors/TLU/ to adjust size and composition of household and livestock, respectively. Average local commodity price was taken as the price adjustment. Expenditures for social obligations, agricultural inputs and animal purchase were excluded from non-food expenditures but added as non food expenditures.

2.5 Methods of setting poverty line

Measurement of poverty involves setting a poverty line that helps to determine the status of poverty. Despite the availability of numerous approaches for estimating poverty line, the Direct Calorie Intake (DCI) and the Cost of Basic Needs (CBN) approach are the most commonly used ones (Ravallion, 1996; Sen, 1981). These approaches are different to define the threshold or poverty line. Accordingly, the DCI uses a minimum requirement of 2200 kilocalories per day per adult equivalent as a poverty line (Taddesse, 1997). But DCI approach takes in to account the calorie content of food items but not the cost of these food items and other non-food items. On the other hand, the CBN accommodates estimating cost of direct calorie intake (food) and other basic non-food requirements (Mundial, 2005; Taddesse, 1997). Among these, the CBN is the most commonly used one due to its consideration of basic non-food requirements while defining the threshold level (Ajakaiye & Adeyeye, 2001; Sen, 1981). Based on this, a food basket of the poorest 50% households and the cost of 2200 kcal/day/AE food consumption with an allowance for essential non-food items were employed to set poverty line for this study (Shugri, 2016; Tesfaye, 2013). The steps involved in implementing CBN method are:
1. Defining a bundle of food items satisfying the predetermined minimum daily nutritional requirement/usually 2200kcal/day/AE;
2. Estimating the cost of this food bundle using the average local price and
3. Computing an allowance for non-food items. Therefore, food and non-food data were collected to set poverty line for Yilamana Densa woreda (Appendix 1).

2.6 Methods of data analysis

This study used both descriptive statistics and econometric model to analyze the collected data using SPSS (Statistical Package for Social Sciences) version 23.0. Descriptive statistics was used to compare and contrast the

poor and the non-poor households with respect to different socio-economic variables.

2.6.1 The FGT poverty index

Foster Greer Thorbeck (FGT) model developed by Alkire &Foster (2011) was employed to analyze the extent of poverty in the study area. The poverty index was given by P_α and defined as follows (Foster *et al.*, 1984):

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{m}\left(\frac{z-y}{z}\right)^\alpha \quad \text{----------2}$$

Where: z-is the poverty line,
Y is the consumption expenditure of the individual household
N The number of people in the population,
M is the number of poor households and
A is a parameter reflecting the weight attached to poverty

When α = 0, the above equation gives us the indices of poverty that is called the head count ratio or simply head count index. It is defined as the percentage of people falling below the poverty line. When α = 1, the above equation gives us the depth of poverty called poverty gap index. When α = 2, the equation shows a measure called the severity of poverty index or squared poverty gap. This poverty index (P_2) gives greater emphasis to the poorest of the poor, as it is more sensitive to redistribution among the poor (Alkire & Foster, 2011; Mburu & Kiriti-Nganga, 2007).

2.6.2 Econometric model:

The choice of econometric model depends on the nature of the dependent variable i.e. nominal, ordinal, interval and / ratio scale. Households' poverty status was the dependent variable of this study which takes 1 if the household is poor 0, otherwise. Therefore, linear probability, binary logit and probit model are used to express and estimate the mathematical relationships between explanatory variables and the binary dependent variable which has qualitative responses. In linear probability model, the estimated probability of the dependent variable lies out of the interval $0 \leq p \leq 1$ unlike logit and probit model. How do logit models differ from probit models? This question is answered by (Park, 2015). The core difference lies in the distribution of the error term. In the logit model, error term is assumed to follow the standard logistic distribution; whereas, probit model is assumed to follow the standard normal distribution. With this minor difference, binary logit is preferable as compared to binary probit because of its mathematical simplicity and interpretation. Following this, binary logit model was employed for this study. Mathematically, the model can be expressed as (Gujarati & Porter, 1999):

$$L_i = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta i\sum_{i=1}^{n} X_i + U_i \quad ---------3$$

Where:
P= Probability of being poor,
β_0 = constant term,
βi = coefficients of explanatory variables,
Xi = Explanatory variables;
μi = Error term, used to capture the unobservable effect of particular variables.

Based on the review of previous empirical studies (Apata *et al.*, 2010; Ayalneh, 2009; Ayehu, 2005; Bilusie & Issac, 2010; Dercon & Hoddinott, 2012; Muleta & Deressa, 2014; Tesfahun, 2009; Tesfaye, 2013), household socio-economic characteristics, institutional and geographical variables were hypothesized to see their effect on farm households poverty (Table 1).

Table 6: Explanatory variables and their hypothesized effects on household poverty

Dependent variable: household poverty: 1 for poor household 0, otherwise			
Variables	**Definitions**		**Hypothesis**
SEXOFHHH	Sex of household heads	1 for male 0, otherwise	+
EDUCSTAT	Educational status	1 for literate 0, otherwise	-
AGEOFHHH	Age of household heads	Year	-
FAMISIZE	Family size	Adult equivalent	+
DEPENRAT	Dependency ratio	Number	+
LIVESOWN	Livestock ownership	TLU	-
LANDOWNE	Land ownership	Hectare	-
SIZLANDR	Size of rented land	Hectare	-
HEALTHST	Health status	1 for health problem 0, otherwise	-
INELABUT	Inefficient utilization of labour force	Number days	+
MAKTDIST	Market distance	Hour	-
CREDSERV	Credit service	1 for user 0, otherwise	+
SAVHABIT	Saving habit of respondents	1 saver 0, otherwise	+
AGRINPCO	Agricultural input cost	ETB	-
WDEAGREC	Woina Dega agro ecology	1 for Woina Dega 0, otherwise	-
DEGAGREC	Dega agro ecology	1 for Dega 0, otherwise	-

3. Results and Discussion

This section presents the main findings of the study obtained from sample respondents. 326 samples were used for statistical analysis. Two observations were dropped due to discrepancy of the data and incomplete observation. Finally, the result was presented using descriptive statistics, inferential statistics and econometric model.

3.1 Demographic characteristics of respondents

The survey result revealed that 281(86.2%) were male headed households; whereas, the remaining 45(13.8%) were female headed household. From male head households, 173 (53.1%) and 108(33.1%) were poor and non-poor; whereas, 30(9.2%) and 15(4.6%) of female headed households were found to be poor and non-poor, respectively. In addition to sex of the respondents, educational status of the respondents was assessed to measure its association with household poverty status. So, the result indicated that 157(48.2%) were literate and the remaining 1169 (51.8%) were illiterate household heads. Therefore, this result is the same with the national literacy rate (48.3%) (CSA, 2012). Among 157 households, 81(24.8%) and 76(23.3%) respondents were poor and non-poor, respectively; whereas, 122(37.4%) and 47(14.4%) of illiterate households were found to be poor and non-poor. Additionally, the chi-square test of association shows that there is statistically significant association between the educational statuses of the household heads and household poverty status at less than 1% significant level (Table 2).

The average age of the total sample household heads were 43.94 years with the minimum and maximum age of 20 and 72 years. But the average age of non-poor and poor households was 40.7 and 45.9 respectively. This indicated that non-poor household heads are younger than poor household heads. The independent T-test analysis indicated that there is significant mean age difference between poor and non-poor households' heads at 5% significant level (Table 3).

Table 7: Association of sex and educational status with household poverty status

Variables	Categories	Household poverty				Chi-square value
		poor		Non-poor		
		N	%	N	%	
Sex of HHH	Male	173	53.1	108	33.1	0.65
	Female	30	9.2	15	4.6	
Educational status	Literate	81	24.8	76	23.3	-3.95***
	Illiterate	122	37.4	47	14.4	

*** Significant at 1% significant level. Source: own field survey 2017

A large family size leads to disintegration of land holdings, especially in rural communities which has its effect on low per capita productivity. This leads to migration of the population either from densely populated to sparsely populated or from rural to urban areas. Both migrants have their own consequence on urban public livings, and on the sparsely populated areas. The survey result indicated that the mean family size of the poor and non-poor households was 5.43 and 4.65, respectively. This implies that poor households had large family size as compared to non-poor households. Similarly, the mean family sizes of poor and non-poor households were found

to be statistically significant at less than 10% significant level. Similarly, the presence of dependent members in the household influences positively the prevalence of poverty. As a result, this analysis was aimed to test whether there is a significant difference in the presence of dependent members between the poor and the non-poor households. The mean numbers of dependents of poor and non-poor households were 0.96 and 0.98, respectively.

Poverty in rural household was related to the physical asset (land). This means poor households have limited size of land for farming. As a result, the result of the survey demonstrated that the mean land ownership of the poor and non-poor households was 4.04 and 3.76 hectare, respectively. The independent T-test result confirms that the land size of the poor and the non-poor households are significantly different. As indicated in table 3, the non-poor can rent or purchase 0.45 hectare as compared with 0.3 hectare for the poor households. This implies that the non-poor households were found to be better in terms of land rent than the poor. In addition to this, livestock is the basic physical asset for rural households as a means of production and used for smoothing consumption during any shocks. As a result, the average livestock ownership of poor and non-poor households was computed using standard conversion factor (Tropical Livestock Unit). Finally, the result indicated that the average livestock ownership of the poor households was 2.8 TLU; whereas, the non-poor households own 3.66 TLU. This theoretical mean difference is statistically significant at 10% significant level.

The survey result indicated that 93(28.53%) of the sample households did not used agricultural inputs (fertilizer, improved seed, herbicides and pesticides) and the rest 233(71.47%) purchased agricultural inputs. Following this, the cost of using agricultural inputs was calculated based on the information gleaned from household survey. The result revealed that the poor and non-poor respondents mean agricultural input costs were found to be Birr 1013.2 and 1825.5, respectively. The mean cost of agricultural inputs for poor and non-poor households was statistically significant at 1% significant level.

Table 8: Descriptive statistics of mean comparison between poor and non-poor households

Variables	Non-poor				poor				T-value
	Min	Max	Mean	Std	Min	Max	Mean	Std	
DEPENRAT	0	3	0.98	0.71	0	3	0.96	0.74	-0.16
FAMISIZE	1	10	4.65	1.96	1	12	5.43	2.14	3.27***
AGRINPCO	0	7161	1825	3.56	0	6400	1013	4.06	-4.97*
LANDOWNE	0	6	1.83	1.65	0	6	1.17	1.49	-3.63**
SIZLANDR	0	12	4.04	2.23	0	12	3.67	2.51	-1.68**
AGEOFHHH	20	72	40.73	11.9	22	72	45.90	12.8	3.60**
LIVESOWN	0	9.88	3.66	2.37	0	12.42	2.76	2.03	-3.69***

****, ** and *significance at 1%, 5%, 10%, respectively. Source: Own survey (2017)

3.2 Household poverty status

The Cost of Basic Needs approach survey result indicated that 203(62.3%) and 123(37.7%) of households were poor and non-poor (Appendix 1). The food and non-food expenditures of the poor and non-poor households were computed to compare and contrast their living difference. The result revealed that the food and non-food expenditures of poor households were less the non-poor households. The average food expenditure per adult equivalent of non-poor households (4078 ETB) was almost nearly double as compared to the poor (2233 ETB). Similarly, the average non-food expenditure per adult equivalent for poor and non-poor households was 618 and 1570 ETB, respectively. Both the food and non-food expenditure result indicates the higher difference of living between poor and non-poor households (Table 4).

Table 9: Mean per capita and per adult consumption expenditure per year

Expenditure in ETB (mean)	Poor	Non-poor	Total	Difference
Food consumption expenditure Per capita	1590	2775	2183	1185
Non-food consumption expenditure Per capita	437	1053	745	616
Total consumption expenditure Per capita	2027	3828	2928	1801
Food consumption expenditure Per/AE	2233	4078	3156	1845
Non-food consumption expenditure Per/AE	618	1570	1094	952
Total consumption expenditure Per /AE	2851	5568	4210	2717

Source: own household survey 2017

3.3 Poverty indices for the study area

The total poverty head count, gap and severity indices were calculated using FGT model. The result indicated that the head count, gap and severity indices were 0.623, 0.189, and 0.058, respectively. As indicated in table 5, the results of poverty estimates for the study area showed that 62.3% of sampled farm households live below poverty line. In terms of money, these proportions of the households were unable to fulfil the minimum amount of food and non-food expenditures i.e., ETB 4096 per adult equivalent per year, respectively. The result of this study was compared with previous studies which used similar methodology (household income consumption expenditure

survey). The table 5 reports the result of this study and previous studies findings for comparison.

Table 10: Poverty indices of the study area compared with other studied results

Poverty Indexes	(MOFED, 2012)	Survey, 2017	difference	(Bilusie & Issac, 2010)	(Tesfahun, 2009)	(Shete, 2004)
Head count ratio	0.304	0.622	+ 0.315	0.790	0.455	0.685
Poverty gap	0.080	0.189	+ 0.108	0.2834	0.272	0.328
Severity index	0.032	0.058	+ 0.025	0.129	0.99	0.187

Source: own household survey 2017

3.4 Agro-ecology and household poverty status

This study mainly focused on the status and extent of household poverty between agro-ecologies. The result indicated that 77.17%, 56.3% and 51% of households were living below the estimated poverty line in Kola, Dega and Woina Dega, respectively. This result clearly revealed that poverty was significantly higher in Kola as compared to Dega and Woina-Dega. This indicated that poverty was serious in the study area and it was different in its magnitude among the three agro ecologies. Head count ratio of the study area (62.3%) was found to be doubled compared to the national head count ratio (30.4) but lower compared to the Kola agro ecology of the study area (77.2%). The poverty gap index of sample respondents (18.8%) was less than the Kola agro-ecology (25.1%). The result of this study concludes that the poverty head count ratio, gap and severity of Kola agro ecology is higher than Dega and Woina Dega agro ecologies (Table 6).

Table 11: Household poverty indices by agro-ecology zone

Poverty Indexes	National rural Poverty 2010/11	The study area 2016/17	Agro-ecological zones		
			Kola	Dega	Woina-Dega
Head count index	0.304	0.623	0.772	56.3	51.0
Poverty gap index	0.080	0.188	0.251	0.156	0.146
Poverty severity index	0.032	0.057	0.082	0.044	0.042

Source: own household survey 2017

3.5 Determinants of farm households' poverty

Sixteen explanatory variables were included into the binary logit model to predict factors affecting farm households' poverty status. Table 7 shows the sign, magnitude, statistical tests and significance level of each explanatory variable. Out of the 16 variables hypothesized to influence farm households' poverty, three were found to be statistically significant at less than 1% significant level. These variables are family size, livestock ownership and Dega agro ecology. Whereas, land ownership, size of rented land and Woina Dega agro ecology were significant at less than 5% significant level. Similarly, table 7 depicts significant variables at less than 10% (education status, saving culture of the household, agricultural inputs cost and inefficient utilization of labour force) significant level.

As expected, family size was found to be positively related with poverty at 1% significant level with 3.74 odds ratio. This means that a household with large family members were 3.74 times more likely to be poor than a household with small family size. This indicates that large family size increases the chance of the households falling in to poverty because large family size increases the food and non-food expenditures to full fill minimum requirements of family members. The result is consistent with previous studies (Awel, 2013; Bigsten *et al.*, 2005; Tesfahun, 2009; Tesfaye, 2013).

Educational status of the household head is negatively related with the probability of falling in to poverty and statistically significant at 10% significant level consistent with the hypothesized effect. The odds ratio of the model indicates that literate households' probability of being poor is 0.56 times less likely compared to illiterate households. This is because literate household heads have better access to information that increase decision making ability, facilitate the possibility of adopting better production technologies, utilizing technical advice from extension workers and diversifying their source of income to full fill minimum requirements of his/her family member. This finding is consistent with the findings of (Ayalneh, 2009; Bogale *et al.*, 2005; Hashmi *et al.*, 2008) .

In line with our hypothesis, livestock ownership was negatively and significantly related to poverty at 1% significant level. This is because livestock rearing is the major source of income, food, draught power, security and investment. As a result, households who have more livestock could generate more income to improve the livelihood of their family members. The result of binary logit model shows that a household who owns more unit of livestock has a probability of 0.79 times less likely to be poor than who don't own livestock. This finding was consistent with (Awel, 2013; Bilusie & Issac, 2010; Shugri, 2016).

Saving culture of the household was positively hypothesized with the probability of falling in to poverty. The model result indicated that the variable was found to be negatively related with household poverty at 10% significant level. This means a household who practiced saving culture was 0.514598 times less likely to be poor

than who do not practice saving. This finding is consistent with (Mohammed, 2017; Shete, 2004).

As expected, agricultural inputs cost was found to be negatively related with the household poverty at 10% significant level with an odds ratio of 0.99. This implies that a household who spends one ETB for agricultural inputs is 0.99 times less likely to be poor than those who didn't spend one ETB for agricultural inputs. Large cost of agricultural inputs indicated that the application of high rate of inputs for farming activities. As a result, applications of agricultural inputs are crucial to increase production and productivity which have better chance to escape from poverty. This finding was consistent with (Bigsten *et al.*, 2005).

Table 12: Result of binary logit model

Variables	**Coef.**	**Std. Err.**	**Z**	**P>z**	**Odds Ratio**
SEXOFHHH	.4049442	.4870575	0.83	0.406	1.499219
EDUCSTAT	-.5815961	.3281957	-1.77*	0.076	.5590055
AGEOFHHH	.404175	.3884238	1.04	0.298	1.498066
FAMISIZE	1.321657	.1957256	6.75***	0.000	3.749628
DEPENRAT	.1613508	.2096987	0.77	0.42	1.175097
LIVESOWN	-.2354899	.0902722	-2.61***	0.009	.7901836
LANDOWNE	-.1650972	.0791815	-2.09**	0.037	.8478113
SIZLANDR	-.2555317	.1101806	-2.32**	0.020	.7745046
HEALTHST	.6261204	.3191799	1.96**	0.050	1.87034
INELABUT	.0147204	.0078102	1.88*	0.059	1.014829
MAKTDIST	-.8027812	.5718938	-1.40	0.160	.448081
CREDSERV	.4027896	.347607	1.16	0.247	1.495992
SAVHABIT	-0.6644376	.3506841	-1.89*	0.058	0.514598
AGRINPCO	-.0002492	.0001443	-1.73*	0.084	.9997508
WDEAGREC	-1.395879	.5885281	-2.37**	0.018	.2476152
DEGAGREC	-1.735111	.6394791	-2.71***	0.007	.1763806
cons	-3.943127	1.464792	-2.69	0.007	
Number of observations					326
Log likelihood ratio					-149.03567
LR chi2(16)					134.03***

***, *** and *significant level at 1%, 5% and 10%, respectively

Both land ownership and rent was negatively hypothesized with farm household poverty. The result indicated that these variables were found to be negatively related at 5% significant level. Households who have bigger size of owned and rented land, cultivate different crops to diversify their income source so as to minimize risks associated with crop failure which have direct role in reducing household poverty. The odds ratio result revealed that a household who own and rent a hectare of land was 0.85 and 0.77 times less likely to be poor than a household who don't own and rented land. This finding was consistent with (Shete, 2004; Shugri, 2016; Tesfahun, 2009).

Woina Dega and Dega agro ecology were negatively hypothesized with household poverty. The result of the model indicated that the variables have negative and significant influence on household poverty status of sample households at 5% and 1% significance level, respectively. The odds ratio reveals that households living in Woina Dega and Dega were 0.24 and 0.17 times less likely to be poor than living in kola, respectively. This might be due to differences in temperature, altitude and the amount and distribution of rainfall patterns which has direct influence on the vulnerability to household poverty. This finding was consistent with (Hashmi *et al.*, 2008).

Number of non-working days, due to social, cultural and religious factors, for productive agricultural activities was used as a measure of inefficient utilization of labour. The variable was positively hypothesized with household poverty status. As expected, the variable was found to be positively and significantly related with the probability of being poor at 10% significance level. Households who were not working in any productive activities for one day was 1.01 times more likely to be poor than whom efficiently used his labour for productive activities. This result consistent with (Dercon, 1999; Ellis & Woldehanna, 2005).

Health status was found to be positively related with poverty at 5% significant level with 1.87 odds ratio. This implied that a household faced health problem is more likely to be poor by 1.87 times than a household who does not faced health problem. The household head that faced health problem spend more expenditure for treatment and loses his productive labour due to prolonged illness. This finding is consistent with (Bilusie & Issac, 2010; Dercon & Pramila, 1998).

4. Conclusions

Poverty eradication is the central development agenda of the government of Ethiopia that guides its development activities. Studies regarding to causes of both urban and rural poverty support the policy of Ethiopia to eradicate poverty so as to bring sustainable development. So, the main purpose of this study is to compare poverty head

count ratio, gap and severity with the national and regional rate in addition to analyzing factors affecting household poverty incidence. As a result, the household poverty measurement result indicated that the overall situation of household poverty in Yilmana Densa woreda is quite higher than the regional and national rate. Consequently, the main findings of this study focused on the key lessons that help to design specific interventions to the study area. In addition to this, the survey result clearly demonstrated that there is high poverty incidence, gap and severity across agro ecologies of the study area. So, this result calls urgent intervention to curve the problem. Similarly, the finding also revealed that covariates of poverty are multidimensional that directs to multidimensional interventions to alleviate the problems faced in the study area. The following policy implications are forwarded based on the result of this study:

- ♥ Family size was found to be significantly and positively influence household poverty in the study area. This implies that having large family size aggravates the rate of trapping in poverty. As a result, household heads should use family planning service to limit their family size.
- ♥ Education status was found to be significantly and negatively related with household poverty status. Education as a human capital increases efficiency of labor, using modern agricultural technology and farm inputs, and entering into more profitable farming. Therefore, access and quality of education should be given special priority to capacitate human capital through education.
- ♥ The mean land and livestock holding of the households were found to be less than 0.25 hectare and 2.8 TLU respectively; which is not enough to full fill the minimum basic needs of average family size (5.13). Therefore, special emphasis should be given to increase productivity through intensive farming.
- ♥ Agro-ecology was found to be an important determinant of poverty; not only because of agro ecological factors but also because of the variation in infrastructure, institutional set up and quality of public service. Because of these, poverty alleviation intervention should give priority to Kola then Dega and Woina Dega respectively by improving access to different institutions, services and direct investments in physical infrastructure to reduced infrastructural social exclusion.

Conflicts of Interest: The authors declare no conflicts of interest.

5. Appendix

Appendix 1: ways of poverty line determination using CBN approach and standards of food

No	Common Food item of the woreda	weight given to food item	quantity	Unit price of the item	Total cost in ETB
1	Cereals (in Kg)		Total =14.22		
1.1	Wheat	35%	4.98	7.45	37.08
1.2	Maize	20%	2.84	5.97	16.98
1.3	Teff	15%	2.13	12.2	26.02
1.4	Barley	10%	1.42	8.3	11.8
1.5	Sorghum	10%	1.42	7.7	10.93
2	Pulses (in Kg)		Total =4.17		
2.1	Beans	40%	1.67	9.8	16.37
2.2	Peas	30%	1.25	11.5	14.39
2.3	Chick peas	10%	0.42	10.75	4.48
2.4	Cow Peas/Grass Pea	20%	0.83	7.02	5.85
3	Vegetables (in Kg)		Total =0.56		
3.1	Onion	75%	0.42	5.5	2.31
3.2	Cabbage	25%	0.14	2.5	0.35
4	Root Crops (in Kg)		Total = 0.14		
4.1	Potato	100%	0.14	2,25	0.32
5	Other Food Items		Total =3.67		
5.1	Coffee (Kg)	20%	0.73	85	62.02
5.2	Cooking Oil (lt)	35%	1.28	25	32.11
5.3	Butter	5%	0.18	85	15.6
5.4	Salt(kg)	35%	1.28	5	6.4
5.5	Sugar(kg)	5%	0.18	16	2.94
Food Poverty Line Per Adult Per month					265.95
Food Poverty Line Per Adult Per annum					3191.4
Total Poverty line Per Adult per month					341.3
Total Poverty line Per Adult per annum					4095.9

Source: Adapted from (Ayehu, 2005; Bilusie & Issac, 2010; Dercon, 1999)

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