

Determinants of Households Vulnerability to Food Insecurity in Ethiopia: Econometric analysis of Rural and Urban Households

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Abstract

Understanding the causes and level of food security would help policy makers to design and implement more effective policies and programs for the poor and thereby helps to pave way to improve food security. This study tried to examine the extent of household's vulnerability to food insecurity in urban and rural areas of Amhara regional state of Ethiopia. Analytical tools used include descriptive statistics, Foster-Greer-Thorbecke (FGT) and Logit model. The findings revealed that about 48% households were vulnerable to food insecure in Amhara region in 2011, with much higher for rural households. This implies that they were not able to meet the daily recommended caloric requirement which is 2200 kcal per day per AE. The results obtained from A binary logistic model indicate those households with large family sizes; lower consumption expenditure, old age households, unemployed and male heads were more food insecure in urban areas. Besides livestock ownerships, farm inputs and farm size, shocks such as drought and illness were the determinants of rural household food insecurity. This finding strongly supports that input access by the poor, promotion of family planning; enhancing livestock packages creation of employment opportunities, delivery of food aid for emergency needy groups, can mitigate food insecurity in the study area. Additionally, Household food security can be improved in the region by focusing on education, creation of income generating opportunities which will raise consumption and family planning programs. The findings also imply that policies should promote diversification of livelihoods and equal opportunities and rights to access resources, particularly in rural areas.

Keywords: food insecurity, vulnerability, Amhara region

1. Introduction

In Ethiopia food insecurity is quite prevalent with sporadic cases of acute food insecurity leading to malnutrition and deaths. Food insecurity is still the major factors that hinder 'Human Development' of the country. A combination of factors has resulted in serious and growing food insecurity problem, affecting as much as 45% of the population. Food insecurity and poverty in Ethiopia are attributed to the poor performance of the agricultural sector, which in turn is attributed to both policy and non-policy factors. Among the non-policy factors, recurrent drought is mentioned as the number one cause of food shortage in Ethiopia. The problem is worsening, despite massive resources invested each year into humanitarian aid and food security programs (MoFED; 2012, UNDP; 2005). Though food security as a problem at the national level, it was first felt in the 1960s, it only started influencing policy in the 1980s, when food self-sufficiency became one of the objectives of the Ten-Years Perspective Plan in the early 1980s. This took place after the 1983/4 drought and famine, which claimed millions of lives (Alemu, et al, 2002). While efforts to ensure adequate food supplies at the national level have done well, these efforts on their own cannot ensure food availability for households and individuals. One stark indicator of the precariousness of food insecurity in Ethiopia is the rising dependence on foreign food aid. Ethiopia is one of the largest recipients of food aid in Africa. The country receives between 20 % and 30 % of all food aid to sub-Saharan Africa (Bezu and Holden, 2008). In terms of food security, it is one of the seven African countries that constitute half of the food insecure population in Sub-Saharan Africa. Average caloric intake in rural areas is 1,750 calories/person/day, which is far below the medically recommended minimum daily intake of 2100 calories/person/day (FAO, 1998). As a result, about 51 percent of the populations are undernourished And there were 5 million people live under chronic food insecurity in nationwide and 10 million people lived under transitory food insecure condition (FAO; 2005, UNDP; 2005).

Amhara region, which represents more than 27% of the national population, is one of the regions of Ethiopia suffered from food shortage every year. Most of the region's area are incorporated under safety net program in order to rehabilitate the farmers' living standard and alleviate their food insecurity problems. However, the region is still characterized by the persistence of food security problems and the need for better intervention. According to the Household Consumption & Expenditure (HCE) carried out in 2011, the proportions of households who are food insecure are about 42.5% in Amhara region. This is the highest one (the region ranked the lowest in the country) and much higher than the national average, which is only 33.6 %. Food insecurity is relatively higher in rural areas than urban, with about 44.6% and 28% of household's food insecure in Rural and Urban areas, respectively (MoFED; 2012). According to UNDP's report (2005), there were 5 million people live under chronic food insecurity in nationwide and 2 million people in Amhara region. In addition, 10 and 2.5 million people lived under transitory food insecure condition in the nation and

Amhara region, respectively. These all implies that food insecurity is still the persistent problem in the region even after the country has shown economic progress. A review of the literature on the household food insecurity shows that there are numbers of studies, which are limited to specific areas, carried out in Amhara region. There is also lack of agreement about the relative importance of factors affecting food insecurity and to the best of knowledge of researchers; there is no analysis of food insecurity carried out in a general context. From the existing literatures (for instance; Shiferaw et al; 2003, Frehiwot; 2007, Dercon et al.; 2005 and Bahiigwa; 1999) it is clear that households food insecurity is associated with a number of socioeconomic and environmental characteristics such as household income/asset, parents' education/occupation, household size, level of Employment, area of residence and access to land holdings, land size and quality. Also policy factors such as the extension services, safety net programs and access to credit have been linked with food insecurity. This study departs from the literatures and above mentioned studies in Amhara region in a number of ways. First, it determined both demand and supply side factors affecting food insecurity in the region. Additionally, food insecurity assessments in the Region have traditionally focused on rural areas. Nevertheless, the global increase of food price and the global financial crisis has put challenges on and increases food insecurity in urban areas. This further driven by unemployment, underemployment, lack of sanitation, rising cost of living, reduced interdependency among urban households, household composition, low asset ownership, low level of education, high dependency on the informal sector, and increased population pressure due to natural growth and rural-urban migration. Thus it is important to better understand the role of external shocks and the strategies that households, communities or public institutions can adopt in order to reduce the likelihood of food insecurity. Without such knowledge it will not be possible to develop effective policy strategies to tackle this problem. This study, therefore, tried to analyze the extent of household's vulnerability to food insecurity and examine deeply the factors that affect households' food insecurity in both rural and urban areas of Amhara region. Analysis carried out in two steps; first at Preliminary stage and second at Multivariate. At Preliminary stage, descriptive statistics, and correlation matrix was constructed. Descriptive statistics is used to describe, compare, and contrast various issues related to households with respect to the desired characteristics. In multivariate analysis, we run multiple regressions using Logit model for determinants of food insecurity.

2. Determinants of Households Food Insecurity

Various studies carried out in developing countries have highlighted a number of factors considered as determinants of household's food security status. Bahiigwa; (1999) showed that inadequate labour, inadequate land, not growing enough food during the seasons and soil infertility, poor health, lack of planting materials, lack of oxen for ploughing were the main factors contributed to household food insecurity in Uganda. Study by Alarcon et al (1993) for smallholder farm households in west highland of Guatemala found that lack of access to credit and cash crop production displace food crops and household consumption of own production is reduced. Thus the household's vulnerability to food insecurity tends to increase. Mucavele (2001) suggested that the main factors that affect food security in urban Maputo, Mozambique, are poverty, low family income, low availability of general alimentation at the family level, floods, family crisis, high unemployment levels and low levels of schooling and training and the absence of a social security system to alleviate the urban shocks. Von Braun et al.(1993), as stated in FAO, denoted that employment and wages, along with prices and incomes, play the central role in determining the food security status of households.

As stated above, the situation in Ethiopia is not much different from the conditions in other developing regions. For example, World Food Programme stated(2009) that the common factors that cause household food-insecurity in urban areas of the country are: household size, age of household, sex of household head, marital status of household, education level of household, dependency ratio, access to credit, ownership of saving account, total income per adult equivalent, expenditure level (food and non-food), asset possession, access to social services, owner of home garden, access to subsidized food, sources of food, availability of food commodities, and supply of food commodities. Shiferaw et al (2003) found technological adoption, farming system, farm size, and land quality are supply-side factors and Household size, per capita aggregate production, and access to market are demand-side factors affecting food security. Teshome(2010) compare the food security situations of the nine districts in Amhara region and the result showed that all the nine districts sample households were vulnerable to food shortage. The study also showed food coverage, landholding, and extension service are the major determinants of sample households. With respect to Amhara region, there are studies by Teshome; 2010, Frehiwot; 2007, and Arega; 2012 which showed, as stated above, a mix of factors affecting households food insecurity in the region.

3. Research Methodology

3.1 Data Sources and Sample Size

The study used data from Household Consumption & Expenditure (HCE) and Welfare Monitoring (WM) Surveys conducted by Central Statistics Agency (CSA) in 2011. The surveys gathered qualitative and

quantitative data pertaining to social, demographic and economic aspects of households. The HCE survey focuses on the income dimension of poverty through measurement of consumption and, expenditure, while the WM survey specializes in the non-income aspects of poverty such as health, education, and access to services. Together, the two surveys paint a complete picture of the poverty and welfare environment of Ethiopia. The method of data collection used two stages of stratified sampling. In the first stage it selects a Primary Sampling Units (PSUs) which is Enumeration Areas (EA). Then, in the second stage a fresh list of households was prepared from within each sample EA's. Accordingly, 2014 and 3058 households were covered in Rural and Urban surveys of in Amhara region, respectively. Therefore, the present analysis based on 5064 sample households randomly selected from enumeration areas of the region.

3.2. Foster-Greer-Thorbecke (FGT) model

Foster et al. (1984) was used to estimate the incidence and intensity of household food insecurity. The FGT model is expressed as follow:

$$FGT(\alpha) = \left(\frac{1}{n}\right) \sum_{i=1}^q \left[\frac{(c - y_i)}{c}\right]^\alpha \dots\dots\dots (1)$$

Where α is the degree of food insecurity with values of 0, 1 and 2 for headcount, short-fall and severity of food insecurity, respectively. Furthermore, in (1) n is total number of sample households, q the number of food insecure households, C is the cutoff between food security and insecurity and Y_i is the measure of per adult equivalent food calorie intake of the i th household.

3.3 Econometric Approach

3.3.1 Theoretical Approach and Model specifications for Food insecurity model

The theoretical framework underpinning our empirical approach of food insecurity is a well-known model in the tradition of Straus (1983), Barnum and Squire (1979), in which a household maximizes a utility function defined over leisure, market-purchased goods & services and home produced goods. Households derive utility from the consumption of foods through the satisfaction found in a set of taste characteristics as well as the health effects of the nutrients consumed. Following Strauss (1983), the household utility function is specified as:

$$U = f(F_h, F_m, L) \dots\dots\dots (1)$$

Where F_h is home produced goods consumed by the household; F_m is a market-purchase good consumed by the household; and L is leisure. For the sake of simplistic exposition, only two goods and leisure will be considered in the model. Results can be generalized to more goods. The household, as both producer (firm) and consumer, is assumed to maximize its utility from the consumption of these goods subject to farm production, income, and time constraints.

An important property of this model is its reclusiveness in the sense that production decisions are made first and subsequently used in allocating the full income between consumption of goods and leisure (Strauss, 1983). The decision on consumption of the bundle (F_h) is influenced by the decision to produce the quantities (Q_i). As a consumer, the household maximizes its utility by equating the marginal rate of substitution between leisure and consumption of good i to w/P_i to the marginal product of labor. The household's supply of labor is determined by the opportunity cost of taking leisure, which is expressed in terms of the marginal product forgone. Following Strauss (1983), we can mathematically derive the production side and consumption-side equations separately.

The model that used for estimation separately for rural and urban is expressed as follows: Following Gujarati (1995), the functional form of logit model is specified as follows: The logistic model (the log-odds ratio) takes the form:

$$P(Y_i = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_i X_i)}} \dots\dots\dots (2)$$

For ease of exposition, the probability that a given household is food insecure is expressed as:

$$P(Y_i = 1) = \frac{1}{1 + e^{-Z_i}} \dots\dots\dots (3)$$

Where: $P(Y_i = 1)$ is the probability that a household being food insecure, Z_i is the function of a vector of n explanatory variables). Equation (14) is the cumulative distribution function. If $P(Y_i = 1)$ is the probability of being food insecure, then $1 - P(Y_i = 1)$ represents the probability of being food secured and is expressed as:

$$1 - P(Y_i = 1) = \frac{1}{1 + e^{Z_i}} \dots\dots\dots (4)$$

Thus

$$\frac{P(Y_i = 1)}{1 - P(Y_i = 1)} = e^{Z_i} \dots\dots\dots (5)$$

is the ratio of the probability that a household was food insecure to the probability of that it was food secure. The natural log of Equation (6) is

$$L_i = \ln \frac{P(Y_i = 1)}{1 - P(Y_i = 1)} = Z_i \dots\dots\dots (6)$$

Where, L_i is the natural logarithm of the odds ratio which is not only linear in the explanatory variables; but in the parameters also. Z_i is a function of n explanatory variables. Thus introducing the stochastic error term u_i the logit model can be written as

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + u_i \dots\dots\dots (7)$$

Where β_0 is an intercept and $\beta_1, \beta_2 \dots \beta_n$ are slopes of the equation in the model, and X is vector of relevant household characteristics. Prior to the estimation of the logistic regression model, the explanatory variables were checked for the existence of Multicollinearity. Variance Inflation Factor (VIF) was used to measure the degree of linear relationships among the continuous explanatory variables and contingency coefficient was used to check Multicollinearity among discrete variables. Moreover, it is estimated separately for sample rural and urban households. Doing so will be necessary because factors that can account for urban households food insecurity may differ from rural households and the extent may also vary across areas

4. Results and Discussions

4.1. Extent of Households Food Insecurity

The results of the summary of the household incidence, depth and severity of food insecurity, are presented in Table 1. The FGT indices namely head count ratio, short-fall and severity of food insecurity are used to show how much the magnitude of food insecurity looks like in the Amhara region. The results show that in 2011 in Amhara region the headcount ratio, short-fall and severity of food insecurity were 48%, 18% and 8.7%, respectively. The results revealed that the incidence of household food insecurity was 0.48. This implies that about 48% of the sampled households were not able to meet the daily recommended caloric requirement which is 2200 kcal per day per AE. That is; 2,458 sample households (48.56 %) were found to be unable to meet their minimum subsistence requirement and 2,604 households (51.44%) were found to meet their minimum subsistence require. The calculated value of food insecurity gap was 18 %. Each food insecure household needs 18% of the daily caloric requirement to bring them up to the recommended daily caloric requirement level besides their per capita consumption and the relative deficiency among food insecure households is 8.7 %.

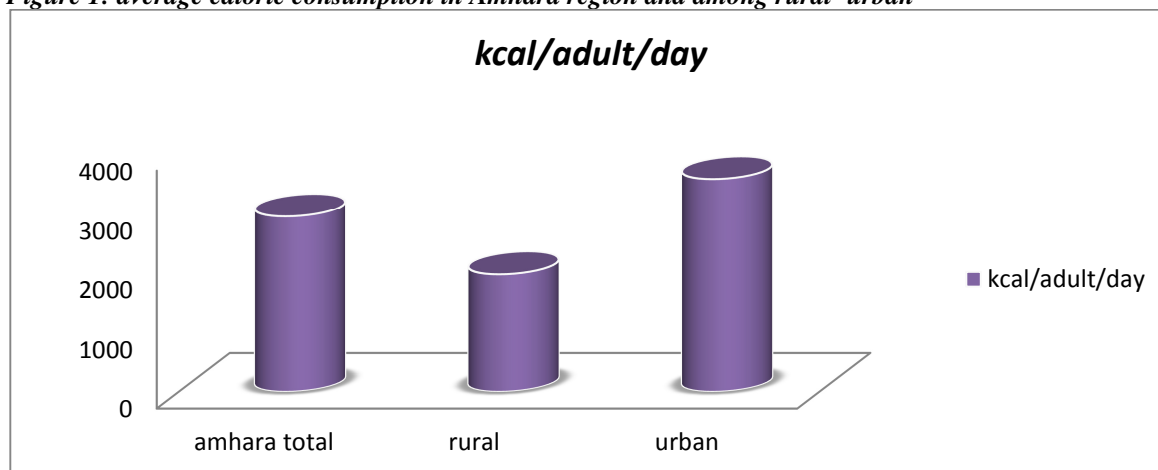
Table 1: Summary of household incidence and severity to food insecurity

variables	Total	Rural	Urban
<i>Incidence food insecurity (Head count ratio)</i>	0.486	0.708	0.341
<i>Depth food insecurity (Food insecurity gap)</i>	0.18	0.12	0.061
<i>Severity food insecurity(Squared food insecurity gap)</i>	0.0879	0.062	0.025

Source: Authors' computation based on the HCES 2011 dataset

A disaggregated analysis of the extent of food insecurity by location presents a more complete picture of the food consumption pattern of the region. The results of the summary of the household incidence, depth and severity of food insecurity by location of households are also presented in Table. Food insecurity was worse in rural household with food insecurity headcount index, short-fall index and severity of 70.8%, 12% and 6.2%, respectively, than the urban counterpart of 34.1%, 6.1% and 2.5%.

Figure 1: average calorie consumption in Amhara region and among rural- urban



One important factor to assess the food insecurity of the household is income or consumption level of household. Households having higher income are obviously less likely to be food insecure, as compared to households with low income. Households with high income can spare more money on food after meeting other needs. Results given in table 2 shows the mean *net calories consumption and mean household expenditure are positively related*. This means, the level of calorie intake improved significantly along with the economic status of the households. For instance, households in the fifth quintile had mean per capita calorie intakes that were 39 percent greater when compared to the calorie intake levels of the household's in the lowest quintile. This indicates the breakdown by total consumption groups shows that the level of daily per capita calorie intake increases as household per capita expenditure increases. This feature of nutrition is consistent with previous findings of studies (Shiferaw et al; 2003, MoFED; 2013).

Additionally, a disaggregated analysis of the extent of calorie availability by types of residence and consumption quintiles presents a more complete picture of the regional food consumption pattern. The table indicates the disproportionate burden of food insecurity among the poorest rural households. For instance, in 2011 the mean net calorie intake and average annual expenditure was only about 2001 and birr 5178 respectively for household from rural areas. However, the corresponding results for households from the major urban areas are 3686kcal and average annual expenditure of birr 9534, implying under nutrition linearly declined with wealth.

Table 2: Calories consumed and the percapita expenditures of households

<i>Quintiles</i>	<i>Average net calories percapita per day(adult equivalent) consumption</i>	<i>Average Annual Total percapita expenditures(in Birr)</i>
<i>Quintile 1</i>	<i>1450.2</i>	<i>2333.344</i>
<i>Quintile 2</i>	<i>1841.605</i>	<i>3520.924</i>
<i>Quintile 3</i>	<i>2390.546</i>	<i>4566.235</i>
<i>Quintile 4</i>	<i>2823.08</i>	<i>6117.595</i>
<i>Quintile 5</i>	<i>4628.935</i>	<i>13615.65</i>
<i>Types of Resident</i>		
<i>rural</i>	<i>2001.93</i>	<i>5178.1</i>
<i>Big city</i>	<i>3686.3</i>	<i>9534.9</i>
<i>other Towns</i>	<i>3491.12</i>	<i>7894.6</i>

Source: Authors' computation based on the HCES 2011 dataset

The general implication of the results of this table is the need for targeting poor households in order to reduce poverty and food insecurity in the region.

The probability of becoming food insecure in the future is determined by the present conditions, the risks potentially occurring within a defined period and the capacity to manage the risks. Vulnerability is determined by a cumulative of events through time. What happened yesterday is reflected in today's status and what happened today influences tomorrow's status. Risk factors threaten food security today and cause vulnerability. At the household level, the major types of risk includes health (illness, disability, injuries), life-cycle related (old age, death), and economic risks (harvest failure, unemployment, price shock). These risks cause food insecurity by lowering food production, reduce income, reduce asset holding, increase indebtedness and reduce uptake of macro and micro nutrients(Lovendal and knowels; 2005). Table 6 provide a breakdown of incidence of shocks by food security status. The poorest and food insecure households are the most likely to report experiencing a shock. Crop production risks, such as crop failure due to pests and diseases, shortage of farm technologies like

seed and fertilizer (due to financial constraints) and lack of alternative income sources were the major features of food insecure rural households. The chi-square and likelihood Ratio (LR) test results presented in Table 6 were also used to test whether or not there is a systematic association between food security status and each predictor variables.

Table 3: Incidences of shocks by type and food security status of households: rural sample

<i>types of shock</i>	<i>FS (%)</i>	<i>FI (%)</i>	χ^2	<i>P-Value</i>
<i>Food shortage</i>	21.83	26.85	5.47	0.019**
<i>illness</i>	4.23	5.54	1.48	0.22
<i>drought</i>	0.70	3.24	13.30	0.000***
<i>crop damage</i>	1.41	3.24	5.80	0.016**
<i>price shock</i>	6.87	8.86	2.17	0.140
<i>reduced income</i>	1.76	2.74	1.70	0.191

Source: Authors' computation based on the HCES and WMS datasets

Food shortage is the most common shock, followed by Price shocks. Illness is reported by 5.54% of food insecure households. Food secure and insecure households comparison shows that Food insecure households experienced food shortage more frequently (26.8% vs only 21.8%) and also as expected, Food insecure households suffer more from drought, crop damages and price shocks which are associated with agricultural production. The global food price crisis which affected most countries, including Ethiopia has led to increases in inflation (MoFED; 2013). Energy prices have also experienced significant rises globally. Such global trends are the main drivers of the increase in reported price shocks. In sum, it showed that Mean vulnerability to shock is, as expected, very high Food insecure households and some interesting policy implications in decentralizing policies to alleviate vulnerability to poverty.

The descriptive analyses presented above suggest some relationship between nutritional indicators and a vector of groups of variables. However, descriptive analysis alone cannot be relied on to establish the existence or causation between variables. To establish the nature and strength of the impact of these variables on household's food security status, we resort to econometric analysis. The results are presented and discussed in the next section.

4.3. Econometric Results

Logistic regression model was used to identify determinants of food insecurity. The dependent variable is household food insecurity which takes a value equal to 1 if household is unable to meet its minimum calorie requirement, 0 otherwise. Before entering the variables, contingency coefficient was calculated. Contingency coefficient value ranges between 0 and 1, and as a rule of thumb variable with value below 0.75 shows weak association and value above it indicates strong association of variables. Since the value for dummy variables was less than 0.75 that did not suggest Multicollinearity problem. Similarly, variance inflation factor of less than 10 are believed to have no Multicollinearity and those with VIF of above 10 are subjected to the problem. The computational results of, the variance inflation factor for continuous variables confirmed the non-existence of association between the variables and were included in the model. The likelihood ratio has a chi – square distribution and is used for assessing the significance of logistic regression. Model chi – square provides the usual significance test for logistic models, that is, it tests the null hypothesis that none of the independents are linearly related to the log odds of the dependent. It is an overall model test which does not assure the significance of every independent. The result is significant at less than one percent probability level revealing that the null hypothesis that none of the independents are linearly related to the log odds of the dependent is rejected. With regard to the predictive efficacy of the model, out of the 2460 sample households included in the urban model, 2051 are correctly predicted or 83.4percent prediction. For rural sample, predictive efficacy of the model, out of the 1803 sample households included in the model, 1509 are correctly predicted or 83.7percent prediction.

Accordingly, among variables fitted into the model for urban sample, in table 4 below, educational level of household head, real percapita consumption, household size, sex of household, access to employment opportunity and remittances were found to be significant in determining household vulnerability to food insecurity. The coefficient for family size has a positive sign and statistically different from zero at 1% level of probability, indicating that this variable was the cause of food insecurity in urban areas. Other things remaining equal, the odds ratio in favor of food insecurity increases by a factor of 2.2463 as household size increases by one. This case shows that as the number of family size increases, family food demand also increases. The possible explanation is as family size increases, the amount of food for consumption in one's household increases thereby that additional household member shares the limited food resources. This result is in conformity with the findings of the above aforementioned literatures. The model also reveals the important role of household consumption expenditure in contributing to household food security as expected. Household consumption increases by one Birr odds ratio in favor of being vulnerability to food insecurity decrease by a factor of 0.999, other variables assumed to be constant. This result is in conformity with the findings of Pearce et

at., (1996), Amsaluet al., (2012). Many studies proved the relevance of household education in reducing household food insecurity and malnutrition. In this respect the results indicate that household head education has significant and positive impact on reducing chronic food insecurity in urban and rural areas. This implies the importance of human capital investments in improving household's food security status. The result for urban sample shows that, other things being constant, the odds ratio in favor of being household vulnerability to food insecure decrease by a factor of **0.94** as education of the family increase by one unit. This is due to the fact that education equips individuals with the necessary knowledge of how to make a living. The effect of education on food security works indirectly by influencing the actions of the person in how to make a living.

Table4: Logistic results for determinants of household's vulnerability to food insecurity: urban sample

<i>variables</i>	<i>Coefficients</i>	<i>Standard error</i>	<i>z-value</i>	<i>odds -ratios</i>
<i>household size</i>	0.8092***	0469	17.22	2.2463
<i>age of household</i>	0 .0021	0 .0036	0.59	1.0021
<i>sex of households(male)</i>	0. 3703***	0. 1224	3.03	0 .6904
<i>real percapita expenditure</i>	-0.0001***	0. .00002	-4.76	0 .9998
<i>ownership of house</i>	0. 1525	0.1234	1.24	1.1647
<i>household education</i>	-0.0522***	0. 0114	-4.56	0.9491
<i>livestock(TLU)</i>	-0.02901	0 .0208	-1.39	0.9714
<i>unemployed</i>	1.010*	0 .6098	1.66	2.748
<i>access to micro-credit</i>	0. 0971	0. 1767	0.55	1.1020
<i>access to market</i>	- 0.1021***	0. 0290	-3.52	0 .9028
<i>price shocks</i>	0 .1457	0 .1938	0.75	1.1569
<i>remittances</i>	-0.6958***	0 .2396	-2.90	0.4986
<i>constants</i>	-2.0952***	0 .3690	-5.68	0.123
<i>number of observations</i>	2460			
<i>Wald chi2(12)</i>	474.19***			
<i>Pseudo R²</i>	0.3631			
<i>Sensitivity</i>	68.12%			
<i>Specificity</i>	91.07%			
<i>correctly classified</i>	83.37%			

Note: standard errors and Robust standard errors and significant at * $p < .1$; ** $p < .05$; * $p < .01$**

Physical access to market as proxied by time spent to get to the market was also found to have a negative and significant relationship with food security, indicating that the farther the household is away from the market place and information about market prices, the less likely the family is food secure. Unemployed households are more likely to be food insecure in urban areas. The variable is significant at 10% probability level and has a positive relationship with food insecurity in the study area. The positive relation indicates that households who have access to employment are less likely food insecure than no access one. Access to employment opportunities help to diversify and increase amount of income received by households. The fluctuation in access to employment determines food insecurity of urban households. The Odds-Ratio shows that other things remaining equal, the odds ratio in favor of food insecurity increases by a factor of **2.748**, as Household become unemployed. This result confirms the finding of Mucavele; 2001 and Von Braun et al.(1993). Moreover, the sign of the coefficients of age of the household head and price shocks showed a positive relationship with food insecurity, though not significant. The other variable was income received through remittance. The coefficient of transfer income is negative and significant at 1% level. This signifies that for a unit rise in transfer income, the level of food insecurity will reduce by **0.4986**. This is due to the fact that an increase in income will have an effect because the change in income will lead to constant change in expenditure. Thus, the additional income received increases the stable income so that capacity of the households to consume more will increase. Thus, the additional income received increases the stable income so that capacity of the households to consume more will increase.

Similarly, the results for rural sample (table 5) show the positive and significant impact of household education on the food security status of the household. Other things being constant, the odds ratio in favor of being household vulnerability to food insecure decrease by a factor of 0.394 as education of the family increase by one unit. This is as expected, since the level of education should positively affect the income earning capacity and level of efficiency in managing the household's food resources. The effect of education on food security works indirectly by influencing the actions of the person in how to make a living. Literate individuals are very ambitious to get information and very curious to accept agricultural or livestock extension services, and soil and water conservation practices including any other income generating activities. The result coincides with the theoretical evidences that educational improvement could lead to awareness of the possible advantages of modernizing agriculture and improve the quality of labor.

Table5: Logistic results for determinants of household's vulnerability to food insecurity: rural sample

<i>variables</i>	<i>Coefficients</i>	<i>Standard error</i>	<i>z-value</i>	<i>odds -ratios</i>
<i>household size</i>	0.9066 ***	<i>0 .0655</i>	<i>13.83</i>	<i>2.476</i>
<i>age of household</i>	0.0091**	<i>0 .0040</i>	<i>2.28</i>	<i>1.0091</i>
<i>sex of households(male)</i>	0 .3073*	<i>0 .1654</i>	<i>1.86</i>	<i>1.3598</i>
<i>real percapita consumption</i>	-0.0002***	<i>0.00004</i>	<i>-3.77</i>	<i>0.9998</i>
<i>livestock(TLU)</i>	-0. 0521**	<i>0 .0261</i>	<i>-1.99</i>	<i>0.9492</i>
<i>off-farm activity</i>	0.1447	<i>0 .2866</i>	<i>0.50</i>	<i>1.1557</i>
<i>household education</i>	-0.0668**	<i>0.0319</i>	<i>-2.09</i>	<i>0.9353</i>
<i>access to market</i>	0 .0109	<i>0 .0068</i>	<i>1.60</i>	<i>1.011</i>
<i>farm size</i>	-0.0256*	<i>0.01507</i>	<i>-1.70</i>	<i>0 .9746</i>
<i>agricultural extension services</i>	-0.1093	<i>0.1675</i>	<i>-0.65</i>	<i>0.8963</i>
<i>local migration network</i>	-0.3792**	<i>0.1630</i>	<i>-2.33</i>	<i>0.6843</i>
<i>use of fertilizers</i>	-0.1374	<i>0.1631</i>	<i>-0.84</i>	<i>0.8716</i>
<i>dummy for Drought shock</i>	1.3660**	<i>0 .5612</i>	<i>2.43</i>	<i>3.9199</i>
<i>dummy for illness</i>	0.436	<i>0.3213</i>	<i>1.36</i>	<i>1.5466</i>
<i>constant</i>	-1.9832***	<i>0.4039</i>	<i>-4.91</i>	<i>0.1376</i>
<i>number of observations</i>	1803			
<i>Wald chi2(12)</i>	320.51***			
<i>Pseudo R²</i>	0.362			
<i>Sensitivity</i>	92.05%			
<i>Specificity</i>	62.40%			
<i>correctly classified</i>	83.69%			

Note: standard errors and Robust standard errors and significant at * $p < 0.1$; ** $p < 0.05$; * $p < 0.01$**

Male-headship increases food insecurity in rural household and it is statistically significant at ten percent relative to the female headed. But one must be careful while analyzing this result as sample size in both groups is different. Male headed households are three times more than female headed households in rural areas; about 78% of rural households are male headed. Similarly, livestock size is negatively and significantly associated with the probability of being household vulnerability to food insecure. The result indicates that, other things held constant, the odds ratio in favor of being food insecure decrease by a factor of 0.9492 as the total livestock holding increase by one TLU. This result is in agreement with the prior expectation and the findings of Shiferaw et al (2003). The negative relationship is explained by the fact that households with large herd size have better chance to earn more income from livestock production. This in turn enables them to purchase food when they are in short of their stock, and invest in purchase of farm inputs that increase food production, and thus ensuring food security at household level. Consistent with others, the result shows positive and significant influence of household size on food insecurity of a household. This means that each additional member of a household increases household food insecurity. This finding is consistence with theoretical and empirical evidences (Teshome; 2010, Frehiwot; 2007). Household size exerts more pressure on consumption than it contributes to production [Shiferaw et al (2003)]. The sign of the coefficient of change in age of the household head showed a positive relationship with food insecurity. As the age of the household head increases by one, the vulnerability of being food insecure increases by *1.0091 factor*. The positive relationship implies that older age household heads have better chance to be food insecure than younger ones. This is possible because older household heads are less productive and they lead their life by remittance and gifts. They could not participate in other income generating activities. On the other hand, older households have large number of families and their resources were distributed among their members. This result confirms with other findings. Moreover; it strengthens the results of the descriptive analysis, which was computed above. The result with regards to the Access to off-farm work was found to be in contrary with what we were expecting for. Access to off-farm work did not have a significant impact on the probability of household food security. The low magnitude of the “partial” effects is most probably related to the low level of wages and unavailability of jobs as needed.

The coefficient of farm size is negative in sign and statistically significant at the 10% level, meaning that farm size exhibits a negative relationship with the food insecurity status of a household. That is, households with larger farm sizes tend to be more food secure than those with smaller sizes, and vice versa. As a household's farm size increases, food insecurity tends to decline. This means households with large cultivated land produce more for household consumption and for sale and have better chance to be food secure than those having relatively small size of cultivated land. The odds ratio for this variable is *0 .9746*. *This indicates that maintaining other determinants constant, additional hectare of cultivated land will reduce food insecurity status of the household by factor of 0 .9746 and vice versa*. Shiferaw et al; 2003, observed that greater efficiencies in the use of resources are associated with the large farms than the small farms. They pointed out that the smallness of

holdings deters the use of. This results in low productivity and low income, and consequently incidence of food insecurity among the farm households. The coefficient of access to extension services has a negative relationship with the food insecurity status of a household, but not significant. This implies that households with access to agricultural extension services tended to have less food insecurity than those that did not have such access and vice versa. This is because contact with extension services tends to enhance the chances of a household having access to better crop. In the areas, where the farmers face crop failure and sales of livestock and livestock product is inadequate, transfer income earned from relatives and migrated household member are an important means of acquiring food. Accordingly, the success of farm households and their family members in coping with food insecurity is highly determined by their ability to get access to migration network opportunities. The result suggests that household's accesses to remittances are endowed with additional income and less likely to be vulnerable to food insecurity. As access to transfer increases by one Birr, through local migration network, the odds ratio in favor of being vulnerability to food insecurity decrease by a factor of 0.6843, keeping other variables are constant. This is plausible because households that have other sources of income in addition to farming alone tend to be more resilient in times of food crisis than those engaged in farming alone. Alternative income sources outside farming provide enhanced security for household livelihood. Finally, Consistent with the hypothesis, vulnerability of rural households to food insecurity is likely to increases with shocks faced by the households like illness, drought, crop failure and others. This confirms the importances of reducing the malign effect of shocks are as to reducing poverty.

5. Conclusions and Implications

Understanding the causes and level of food security would help policy makers to design and implement more effective policies and programs for the poor and thereby helps to pave way to improve food security. The purpose of this study was to carry out empirical estimation of determinants of urban and rural household food insecurity in Amhara region of Ethiopia. The study showed that about 48 % of the households were not able to meet the daily recommended caloric requirement and the percentage of food consumption needed to bring the entire food insecure population to the food poverty line is 18percent while 8.7% sample households were most food insecurity households groups in the study area. Further, the descriptive statistics shows that there was evidence of location and Rural households were likely to suffer more insecurity than urban households. It also suggests that food insecurity is highly concentrated among households from the lowest quintiles. The result of the logistic regression model indicated that household size, household head education, *annual percapita consumption*, and access to employment were found to be statistically significant as determinants of household food insecurity in urban areas. *Further, the study has shown as the major factors affecting food insecurity of rural households were family size, age and sex of household head, total cultivated land size of household head, annual percapita consumption, and livestock holding. It indicated, annual percapita consumption, and livestock holding has a significant and positive influence on the state of household food security while family size and food security were negatively related. Based on the findings of the study, the following policy recommendations are forwarded. First, this finding strongly supports that input access by the poor, promotion of family planning; enhancing livestock packages creation of employment opportunities, delivery of food aid for emergency needy groups, can mitigate food insecurity in the study area. Additionally, Household food security can be improved in the region by focusing on education, creation of income generating opportunities which will raise consumption and family planning programs. The findings also imply that policies should promote diversification of livelihoods and equal opportunities and rights to access resources, particularly in rural areas and creation of employment opportunities in urban areas. The effect of education on household food insecurity confirms the significant role of the variable in consideration for betterment of living condition. The more household head educated, the higher will be the probability of educating family member and familiar with modern technology, which the twenty first century so badly demands. So, strengthening both formal and informal education and vocational or skill training should be promoted to reduce food insecurity in the study area. Productive assets are highly binding resource in the rural area and negatively related with food insecurity. Therefore; development partner support ought to scale up on existing rural protection programs to ensure building up of assets for the asset poor households. The access to employment opportunity negatively related with food insecurity in the study area. Access to job helps urban households to diversify their income which in turn alleviates the food deficiency among poor households. Therefore; both government and civil society organizations have roles to play in addressing these issues. The policy initiatives that will do most to enhance the potential for self-employment are basic condition in reducing food insecurity in the urban areas. In general, the results of this study produce the implication that attaining food security in the Amhara regional state of Ethiopia requires adoption of mixed strategies and policies along those variables found to have a significant effect on food insecurity status of rural and urban households.*

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