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Determinants and Coping Strategies of Household Food Insecurity in Rural Areas of Tigray: The Case of Rural Adwa Woreda

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Abstract

This paper identified the major determinants of household food insecurity and their local coping strategies based on primary data collected from 180 randomly selected households of rural Adwa Woreda, Tigray National Regional State. To assess the determinants of food insecurity binary logit model is employed. The extent and magnitude of household food insecurity, food expenditure inequality, and the coping strategies of the food insecure households are also identified using indices of Foster, Greer and Thorbecke (FGT), Gini Coefficient, Lorenz Curve and Coping Strategy Index. The absolute food poverty line for the study area during the study period is estimated to be ETB 1634.75 per adult per year. The incidence, depth and severity of food insecurity are 63.33 percent, 18.82 percent and 6.99 percent respectively. Furthermore, the Gini Coefficient for the study area is found to be 31.20 percent. Among the most common coping mechanisms of households in the study area include selling household asset, leaving the entire days without eating and sending household members for beg. Access to agricultural extension services, off farm income, number of oxen owned, total land size and safety net participation are found to be the major determinants of household food insecurity that significantly reduce the level of households food insecurity in the study area. Whereas age dependency ratio, family size, crop disease incidence and fertilizer utilization are uncovered to be significant and positive covariates of household food insecurity in the study area.

Keywords: Food Insecurity, Coping Strategies, Absolute Food Poverty Line, Determinants of Household Food Insecurity.

Introduction

The biggest killer disease in Africa is neither malaria nor HIV/AIDS. It is rather poverty which kills and maims millions both directly and through its facilitative role of other killer diseases (Meles, 2010). This implies that the serious challenge facing African countries in general and Ethiopia in particular is poverty, which further reinforces food insecurity situation

There are more than one billion poor people in the world, 800 million food insecure and about 170 million children malnourished. Most of them are found in Sub Saharan

Africa, Asia and South America countries. As most of Sub Saharan African countries, Ethiopia is one of the low income countries in the world (Tsegay, 2009). High risks in agriculture and limited alternative sources of income result in large fluctuations in households' income level. The household asset base is limited and safety nets for the poor remain insufficient. In spite of its vast agricultural potential, Ethiopia has been trapped in the state of food insecurity and poverty.

The country has been chronically dependent on food aid, and it is currently one of the largest recipients of food aid in Africa. The average yield of food crops has been about 11 quintals per hectare, and has been growing only about 0.6 percent and lags behind the population growth by about 3 percent, resulting in an annual per capital decline of 2.4% in domestic food production. Ethiopia's population grew from 23 million in 1960 to 65 million in 2001, and it is expected to double in the next 25 years (CSA, 2001).

The causes of rural poverty in Ethiopia are many due to fluctuations in agricultural production as a result of drought, ineffective and inefficient agricultural marketing system, under developed transport and communication networks, underdeveloped production technologies, limited access of rural households to support services and environmental degradation (Regassa et al., 2007).

Agricultural activity is the mainstay of the Tigray region. The region has been characterized by erratic rainfall and drought stricken economy. As reviewed in Tsegay (2009) this region is one of the most disaster prone and food insecure regions in Ethiopia. The region has been dependent on relief assistance for many years. According to the socio-economic survey conducted in the region in 1995, only 16 % of the population was reported to be self-supporting, while the vast majority of 84% couldn't support themselves (REST, 1995).

Materials and Methods

Sources and method of data collection

For the purpose of this study, data were collected both from primary and secondary sources. A cross sectional primary data was collected from 180 randomly selected households in the study area through structured questionnaire. The questionnaire was pre-tested and pilot survey was conducted in order to add to the validity of the data collection instrument and reliability of the collected data. To supplement the primary data sources, secondary data were also collected from published and unpublished sources so as to generate information about the general background of the Woreda.

Method of Data Analysis

Determination of food poverty threshold level

A number of methods are available to determine the food security threshold level for households to classify either into food secure or insecure. The most widely used ones are Direct Calorie Intake (DCI), Food Energy Intake (FEI) and Cost of Basic Need (CBN) approach.

In the direct calorie intake method, food poverty line is defined as the minimum calorie requirement for survival. Hence, this method equates food poverty with malnutrition. The basic problems with this method are; it does not take in to account the cost of getting the basic calorie requirement and cannot reveal the extent of impoverishment of a given society.

In the food energy intake, food poverty line is defined as the level of per capita expenditure at which people are expected to meet their predetermined minimum calorie requirement. This method is an improvement over the direct calorie intake in terms of representativeness of the food poverty line as it now provides the monetary value rather than purely nutritional concept of food poverty. However, this method does not yield a consistent threshold food poverty line across different regions of a country and over time. This is mainly due to the fact that household consumption pattern might vary across regions and over time.

Finally the cost of basic needs method is used to find the value of consumption necessary to meet minimum subsistence needs. The food poverty line, in this case, is defined by selecting a "basket" of food items typically consumed by the lowest 50 percent poor sample households.

Even though DCI and FEI can be used to determine the food security threshold level, they fail to identify the reference food basket items and scaling of the quantities according to the corresponding nutritional requirement. Hence, the Cost of Basic Needs (CBN) is used in this study.

According to the cost of basic needs approach, identifying the poorest 50% of the sample population as a reference group (Households) is the first step, assuming that in rural Woreda Adwa the food insecure (poorest) part of society is above 50 %. As a second step, the food consumption behavior of the reference group is accessed to identify the reference food basket items and determine the average quantities of basic food items per adult equivalent that make up the reference food basket. The reference food basket, in this study, is composed of the mean consumption levels of 15 food items. The calorie value of each food items is obtained from World Health Organization (WHO) of the food nutrition table. Following, Ravallion and Bidani (1994) the total calorie obtained from consumption of this basket of average quantity per adult by an individual is determined as:

$\sum q_i Kcal_i = T*'$ with T $\cong$ $T*'$. But $T*' \neq T$ ---------- [1]

Where T * = total calorie obtained by individual adult from consumption of the average quantities.

q_i = average quantity per adult of food item 'i 'consumed by individual

$Kcal_i$ = the caloric value of the respective food item 'i 'consumed by individual adult

T = 2200 kilocalorie; recommended calorie per day per adult equivalent (Ethiopian Health Institute)

The average quantity per adult of each food item scales up and down by a constant value $\left(\frac{T}{T*}\right)$ so as to provide total of 2,200kilocalorie per adult per day before doing any activity. Then, multiply each food items after scaling up or down by the median price and sum up to get a food poverty line.

In this study, food security is defined as the extent to which household food expenditure per adult equivalence meets its subsistence requirement. Thus, household's total food expenditure is defined as total food expenditure incurred by any member of the household.

The reasons why the total food expenditure per adult equivalent was used in this study include; first, consumption expenditure is typically preferred over income as the consumption expenditure per Adult Equivalence (AE) better reflects households' ability to meet their basic needs. Second, consumption is viewed as the preferred welfare indicator than income as the former is believed to capture long-run welfare level than current income. Third, consumption reflects the ability of a given household's access to credit and saving at times when their income is too low. Fourth, income is one of the factors that enable consumption but not the sole resource of consumption. Fifth, in a developing country setting like Ethiopia, households are likely to underreport their income level more than they do with their consumption level (MOFED, 2002). Furthermore, the reliability of income data in subsistence farming where record keeping is limited is always questionable (Tesfaye, 2003). Hence, consumption expenditure is better indicator used to measure household's food security than income approach does. However, for consumption expenditure to be an indicator of household's welfare it has to be adjusted for the age composition of each household via an adult equivalent scale that best reflects the nutritional requirement of each family member taking each one's age and sex in to account. The adult equivalent scale must therefore be different for different age groups and gender of adult members (MoFED, 2002).

Measurements of food insecurity profile

To determine households' food insecurity profile Foster, Greer and Thorbecke (FGT), (1984), class of decomposable food insecurity measure is used. It is presented as follows;

$$P(C_j, Z, \alpha) = \frac{1}{N}\sum_{j=1}^{n}\left[\frac{(Z - C_j)}{Z}\right]^{\alpha} \quad \text{---------- [2]}$$

Where: Z refers to the food poverty line, $\mathbf{C_j}$ is the welfare indicator for household **j** in per adult consumption expenditure, **N** is the total sample size, and **n** is the total sum of food insecure households ordered from bottom to food poverty line. The poverty or food insecurity aversion parameter (**α**) reflects the concern attaches to the proportionate shortfall from the food poverty line.

Head Count Index: If **α** = 0, then the Foster, Greer and Thorbecke (FGT) measures corresponds to the head count index in which no concern for the depth of the shortfall is given. In other words, it is the share of sample households whose food expenditure per adult equivalent falls below the food poverty line.

Food Insecurity Gap: If **α** = 1, then FGT is equal to the mean distance that separates the food insecure household from the food poverty line, i.e., measure of depth of food insecurity. In other words, the food insecurity gap index provides information regarding the distance between the food poverty line and each household's food expenditure per adult equivalent. It captures the mean aggregate consumption shortfall relative to the food poverty line across the sample. It is, therefore, a much more powerful measure than the head count ratio because it takes into account the distribution of the food below the poverty line. That is, it reflects the per capita cost of eliminating food insecurity.

Food Insecurity Severity Index: if **α** = 2, then FGT measures the severity of food insecurity. It is sensitive to inequality among the food insecure households. It takes in to account not only the distance separating the food insecure from food poverty line, but also inequality among the food insecure.

Measuring expenditure inequality and food insecurity

Measuring inequality is broader than food insecurity since it focuses on the entire population rather than only on the food insecure households. Economists usually like to use personal or size distribution of income or expenditure for both analytic and quantitative purposes (Todaro, 2003). Thus, the researchers used the size distribution of expenditure approach while analyzing inequality in the study area. For that purpose, households were listed in ascending order of food expenditure per adult per annum and then divide the total population into distinct groups. The commonly used method is to divide the population into successive quintiles (fifths) and deciles (tenths). Furthermore, to know food expenditure inequality in the study area, the researchers also applied the Lorenz Curve. It is defined as follows (Araar, 2006):

$$L(P) = \frac{\int_0^p Q(q)dq}{\int_0^1 Q(q)dq} = \frac{1}{\mu}\int_0^p Q(q)dq$$ ---------- [3]

In equation 3 the numerator sums the expenditure per adult per annum of the p proportion (the poorest 100p %). The denominator sums the total food expenditure per adult per annum of total sample households. Thus, *L (p)* indicates the cumulative percentage of total food expenditure spent by a cumulative proportion *p* of the population, when households are ordered in increasing food expenditure per adult per annum values.

The Lorenz curve has several interesting properties. It ranges from *L (0) = 0* to *L (1) =1*, since a proportion *p=0* of the population necessarily spends a proportion of 0% of total food expenditure, and since a proportion *p=1* of the population must spent 100% of aggregate food expenditure. *L (p)* is increasing as *p* increases, since more and more food expenditures are then added up. The Lorenz curve is also convex in *P*, since as *p* increases, the new food expenditures per adult per annum that are being added up are greater than those that have already been counted.

If all sampled households have the same food expenditures per adult per annum, the cumulative percentage of total consumption spent by any bottom proportion *p* of the population in the rural area would also be *p.* The Lorenz curve would be *L (p) =p*: population shares and shares of total food expenditure per adult per annum would be identical.

Therefore, the distance between zero inequality line and the Lorenz curve becomes *p* – L (p). The larger the "deficit" the larger the inequality of welfare among the inhabitants of the Woreda will be. By aggregating that deficit between sample population shares and food expenditure per adult per annual share across all values of *p* between 0 and 1, we would get half the well-known Gini index of inequality. The Gini index implicitly assumes that all "share deficits" across p are equally important. It thus computes the average distance between cumulated population shares and cumulated food expenditure per adult per annum. The magnitude of welfare inequality of the society is estimated using Distributive Analysis Stata Package (DASP).

$$\frac{Gini\ index\ inequality}{2} = \int_0^1 (P - L(P))dp$$ ---------- [4]

Coping strategies index

Coping Strategies Index (CSI) is employed to assess and identify the coping strategies of household. Following Maxwell, D. and Caldwell, R., 2008, a set of questions was developed to capture people's basic consumption-related coping responses to

inadequate access to food in a study area. In constructing the coping strategies index we need to follow certain steps;

Step -1: Getting the Right List of Coping Behaviors for the Location: The first step is to identify the locally relevant coping strategies in the study area. These fall into four basic categories:

- Dietary change
- Short-term measures to increase household food availability
- Short-term measures to decrease numbers of people to feed
- Rationing, or managing the shortfall

Step-2: Counting Frequency of the Strategies: It has been demonstrated that there is always a trade-off between the representativeness of a set of answers and the accuracy of those answers. A longer recall period generally provides information that is more representative of typical behaviors, but the longer the recall period, the less accurate the memory of respondents about their actual behaviors. Hence, questions in this study are based on seven day recall period.

Step-3: Severity (Categorizing and Weighting the Strategies): The CSI tool relies on counting coping strategies that are not equal in severity. Different strategies are "weighted" differently, depending on how severe they are considered to be by the people who rely on them. The frequency answer is then multiplied by a weight that reflects the severity of individual behaviors. To determine the severity weight of each coping strategies focus group discussions in each selected Kebelle were conducted so as to assign a weight to each coping strategies, from lowest(least severe) to highest(most severe). A range of weights from one to four usually works well. The, average severity weight of the three groups was determined and used in the analysis.

Step-4: Scoring: Combining Frequency and Severity for Analysis: For the purpose of analysis of the results of CSI, two more pieces of information are needed. The first is a means of scoring the relative frequency; the other is a means of scoring weight, just derived in Step 3. This can be summarized by the following relationship:

$$CSI = \sum_{i=0}^{k} F_i S_i \quad \text{---------- [5]}$$

Where:

F_i = Frequency of the i^{th} coping mechanism taken by a household in the past seven days

S_i = is the severity weight attached to i^{th} coping mechanism and

k = maximum number of coping strategy

For that purpose, Focus Group Discussions (FGD) in each sample Kebelle was conducted. The participants of the focus group discussion were member of the farm households. The aims of the discussions were to list out the coping strategies that households in their respective Kebelle might consider when they face shortage of food supply and rank them based on their severity so as to assign weight to each strategy.

Model specification

The dependent variable of the model; status of household food insecurity; is a binary or dichotomous variable representing the status of household either being food secured or not. In estimating binary choice models Linear Probability Model (LPM), logit and probit are the possible alternative models and have been widely used for a binary response variable (Gujarati, 2004). Some of the problems of applying the Ordinary Least Squares when the response variable is dichotomous are: [1] Non-Normality of the Disturbances $[\mu i]$, although OLS does not require the disturbances $[\mu i]$ to be normally distributed, we assumed them to be so distributed for the purpose of statistical inference. [2] Heteroscedasticity Variance of the Disturbances terms: the classical assumption of homoscedastic can no longer be maintained in LPM. As statistical theory shows, for a Bernoulli distribution the theoretical mean and variance are, respectively, P and $P(1-P)$, where P is the probability of success (i.e. in our case the probability of household being food secure), showing that the variance is a function of the mean. [3] Possibility of $E(Yi/X)$ might lie outside of Logical band; that is, the range of 0 to 1. Hence, there is no guarantee that Ŷi, the estimators of $E(Yi \mid Xi)$, will necessarily fulfill this restriction, and this is the real problem with the OLS estimation of the LPM. [4] Even the fundamental problem with the LPM is that it is not logically a very attractive model because it assumes that $Pi = E(Y = 1/X)$ increases linearly with X; that is, the marginal or incremental effect of X remains constant throughout.

Hence, logit model is employed in analyzing the determinants of household food insecurity. It is given by the following formula:-

$$Pi = f(Zi) = f(\alpha + \beta iXi) = \frac{1}{1+e^{-(\alpha+\sum\beta iXi)}} \quad \text{---------- [6]}$$

Where: e = is the base of the natural logarithm

X_i = stands for the i[th] explanatory variable

P_i = is the probability that a household is being food insecure given Xi and

β_i = is parameters to be estimated

α =constant term of the logistic regression function

Following Gujarati (2004) the logistic model could be written in terms of the odds ratio and log of odds ratio, which enable one to understand the interpretation of the coefficients. In this study, the odds ratio is the ratio of the probability that a household would be food insecure (P_i) to the probability that a household would be food secure ***(1-P_i).***

$$(1 - \mathrm{Pi}) = \frac{1}{1+e^{zi}} \text{ ---------- [7]}$$

$$\left(\frac{Pi}{1-Pi}\right) = \frac{1+e^{zi}}{1+e^{-zi}} = e^{zi} \text{ ---------- [8]}$$

Therefore,

$$\left(\frac{Pi}{1-Pi}\right) = \frac{1+e^{zi}}{1+e^{-zi}} = e^{(\alpha+\sum\beta iXi)} \text{ ---------- [9]}$$

Taking the natural logarithm of equation (9)

$$Y_i = \ln\left(\frac{Pi}{1-pi\_}\right) = \alpha + \sum^{k} \beta_i X_i \text{ ---------- [10]}$$

$$Y_i = \alpha + \sum_{i=1}^{k} \beta_i X_i + \mu_i \text{ ----------[11]}$$

Where: K= the number of explanatory variables; Xi= vector of independent demographic and socio-economic variables of households and μ=the error term of the model

Dependent variable of the model: Households whose food expenditure per adult per year are greater than and equal to food poverty line are regarded as food secure and assigned a value of 0, while households whose food expenditure per adult per year less than the cutoff point are regarded as food insecure and assigned a value of 1.

Explanatory variable of the model are summarized and defined in table 1 below.

Table 1: Summary of definition of explanatory variables used in the Binary Logit Model

Codes	Types	Definition of Variables	Expected Sign
HHsex	Dummy	Sex of head of the HH, 1 if the household head is male,0 otherwise	Negative
HHeduc	Dummy	Education level, 1 if the household head is literate, 0 otherwise	Negative
Crdt	Dummy	Access to credit,1 if the household get credit access ,0 otherwise	Negative
Offfarminc	Dummy	Off farm income, 1 if the household has off-farm income, 0 otherwise	Negative
AgrExt	Dummy	Access to Agricultural extension services, 1 if the household has access to agricultural extension,0 otherwise	Negative
Irig	Dummy	Access to Irrigation, 1 if the household has access to irrigation , 0 otherwise	Negative
SNPP	Dummy	Participation in safety net program, 1 if the household participates in safety net program , 0 otherwise	Negative
Cropdises	Dummy	Incidence of crop disease, 1 if the household face crop disease incidence, 0 otherwise	Positive
Ferti	Dummy	Access to fertilizer, 1 if the household has access to fertilizer, 0 otherwise	Negative
AgedepRatio	Continuous	Age dependency ratio per household	Positive
Age	Continuous	Age of household head	Indeterminate
Oxen	Continuous	total number of oxen owned per household	Negative
FmsizAE	Continuous	Family size in Adult equivalent	Positive
TotIndsiz	Continuous	Total land owned per household	Negative

Source: Survey Data, 2010/11

Results and Discussion

Food security threshold level

In this study the cost of basic needs approach is employed to establish the threshold level of food security. Accordingly, the absolute food poverty line during the study period (March 2011) is estimated to be ETB 1,634.75 per adult per annum. This is considered as the minimum expenditure an adult individual in study area need in order to lead healthy and active life. This implies that those households whose food expenditure per adult per annum greater than and equal to ETB 1,634.75 are designated as food secure otherwise insecure. Accordingly, it is observed that 63.33 percent of the total respondents in study area are found to be food insecure.

Demographic and socio-economic characteristics of household

Table-2: Household Food Security status and Household characteristics (Continuous variables)

Continuous Variables	*Food Insecure (№=114)*		*Food Secure (№=66)*		*t- value*
	Mean	*SD*	*Mean*	*SD*	
Family size(in Adult Equivalent)	*6.1154*	*1.7538*	*850*	*1.6443*	*7.0905****
Age of the HH	*47.9386*	*10.7055*	*43.8485*	*11.5682*	*2.3978***
Age dependency ratio	1.1141	0.8393	0.9644	0.6820	1.2315
Landholding per adult Equivalent (Ha)	*0.0905*	*0.0339*	*0.1545*	*0.6493*	*8.6971****
Livestock holding (TLU)	3.1023	*1.8311*	*3.2086*	*2.1698*	0.3505
Oxen Ownership in Number	1.3421	0.7851	1.4091	1.0225	0.4926
Food Aid Share	*0.2015*	0.0695	0.1472	0.0437	*3.936****
Food Share	0.7437	0.0875	0.7919	0.0730	*3.755****
Share of Human Capital Investment	0.2351	0.1281	*0.1827*	*0.1277*	*2.6471***

Source: Survey Data, 2011
Note: ***, ** and * Significant at 1%, 5% and 10% significance level

It was hypothesized that household size will negatively influence the food security status of household. In other words, as the number of household members increases the number of mouths waiting for food will increase and this exacerbates food shortage. Family size is, therefore, one of the potential demographic variables that would have due contribution for household food insecurity.

Table 2 shows that the mean adult equivalents are about 4.235 and 6.115 for the food secure and insecure households, respectively. The mean difference between the two groups is significantly different at 1 percent level of significance. The overall mean adult equivalent is 5.426 which imply that family size of the sample Kebelles in

particular and rural Woreda Adwa in general puts greater pressure on the existing resources of households and hence has negative impact, as hypothesized, on the food security status of households. This finding is consistent with prior expectation of the researchers and empirical findings of Abebaw (2003) and Tesfaye (2003), Tesfaye (2005), Genene (2006) and Frehiwot (2007).

The current debate among scholars about the relationship between age of household head and food security status of households can be categorized in two camps. The first group goes on arguing that as the age of household head increases, she/he can acquire more knowledge and experience on how to farm, use farm inputs and forecast the weather conditions. Furthermore, as the age of household head increases his or her experience about farm resource and risk management increases as well. Hence, she or he will be less prone to be food insecure with age. On the other hand, the second group of scholars suggests that even though with age experience and wealth might accumulate as well; due to natural limit and sickness of individuals; and given the fact that farm activities in small and traditional farm households demand more physical labor than human capital. Thus, household head age and food security status are found to be inversely related.

The mean age of the sample household heads is around 46.44 with standard deviation of 11.17. The t-test confirmed that there is statistical significance difference mean age of household heads between the two groups. This finding is also consistent with those scholars who argued that there is an inverse relationship between age of household head and household food security status.

Land is one of the key assets owned by households to earn their means of livelihood. In the rural area land is one of the major sources of income of household. It was hypothesized that households who own large area of arable land are less likely to be food insecure. The average farm size per adult equivalent of the sample households is about 0.114 ha. The t-test indicates that there is a significant difference in farm size per adult equivalent between food secure and insecure households at less than 1 percent level of significance. This finding is also in line with the prior anticipation of the researchers and empirical findings of Mulugeta (2002), Abebaw (2003), Tesfay (2003), and Tesfaye (2005).

In the study area households acquired food from, own production, purchase and food aid. When they run about their own produce, they are compelled to obtain food through purchase. However, household in rural area may not able to purchase food, as the income generated from other sources is not sustainable. As a result they rely on food aid. In this study food aid share refers to the percentage share of food aid to total annual food consumption expenditure of household. The mean food aid shares of food secure and insecure households are 14.72 percent and 20.15 percent, respectively. Food aid share difference of the two groups is statistically significant difference at 1 percent of significance level (see table 2).

If food aid was not in place, at the given food poverty line i.e. ETB 1634.75, the incidence of food insecurity would have been more severe than it is with food aid. That is, it would have been raised from the current level of 63.33 percent to 72.78 percent. This has important policy implications in a sense that food aid is an important government program that so far helped a significant number of households in the study area to secure food. Hence, the question that is left unanswered and still needs to be addressed is what would happen to the society if food aid is to be terminated?

Many literatures on households' expenditure suggest that people in developing countries usually allot lion share of their expenditure on food items. This is to say that as their income increase households in such countries spent more on food items than non-food items like, education and health and the like. Table 2 also presented a summary of food share of the selected households during the study period. The mean food share of the selected households in the study area is 76.13 percent and there is a significance difference in mean food share of households between the two groups at 1 percent level of significance. Amazingly, it seems that, on average, the food insecure households spend less of their income on food items as compared to their food secured counterparts.

Human capital often refers to education, health, and other human capacities that are believed to raise productivity when increased (Todaro, 2003). It refers to the stock of skills and productive knowledge embodied in the people. Any activity that increases the quality of workers and their productivity is an investment in human capital. In this study, expenditure made by households on health and education is used as proxy for human capital.

Higher expenditure on these services is considered as an increase in investment on human capital. It is measured as a share of expenditure on health and education to total non food expenditure. From table 2 it can be seen that the mean percentage share investments on human capital of food secure and insecure households are 18.27 percent and 23.51 percent, respectively. This difference in human capital investment shares between the two groups is statistically significant at less than 5 percent level of significance.

Accordingly, it can be concluded that, significant proportion of the food insecure households in the study area spend sizable portion of their income on non food expenditure namely, on education and health. This implies that households (particularly food insecure) in the study area are investing in long term and most probably sustainable human capital formation. It is important to note that here if the households in the study area diverted their resources from investment on human capital to food consumption at the absolute food poverty line (ETB 1634.75); food insecurity incidence would have been reduced from the current 63.33 percent to 55.56 percent.

Table 3: Household Food Security Status and Household Characteristics (Categorical variables)

Categorical Variables		Food Insecure (%)		Food Secure (%)		χ^2
		Number	Percent	Number	Percent	
Sex	Female	12	10.53	16	24.24	5.9866**
	Male	102	89.47	50	75.76	
Educational Status	Literate	38	33.33	32	48.48	4.0378**
	Illiterate	76	66.67	34	51.52	
Fertilizer Utilization	Yes	113	99.12	65	98.49	0.1548
	No	1	0.88	1	1.51	
Access to Credit	Yes	106	92.98	64	96.97	1.2665
	No	8	7.02	2	3.03	

Source: Survey Data, 2011
Note: ** Significant at 5% significance level

It is generally believed that male has better physical endurance and capacity. Furthermore, as a matter of fact agricultural activities demand higher physical effort and females have also additional responsibilities in side their home. Hence, it was expected that male headed households are more food secure than their female headed counterparts. The chi- square test revealed the fact that there is statistically significant difference between the two groups at less than 5 percent significance level, which means the probability of being food insecure decreases if the household head is female (Table 3). This may be due to the fact that female heads are better at resource management and planning than male heads did. Moreover, this finding might be the outcome of the government policy of empowering women and provision of different supports to women as a part of government's affirmative action not only in the study area but also in the country at large. Hence, this is good news for those who put unprecedented efforts to empower women in the study area in particular and in the region in general. This finding is against the hypothesis that male headed households are more food secure than that of female headed ones. It is not also consistent with the empirical findings of Frehiwot (2007).

Educational back ground of head of household was expected to have a positive impact on the household food security status. Educated household heads are believed to be less resistant to changes and are capable of reading and understanding different instructions and manuals on the application of fertilizer, pesticides and weed killer packages. They are also capable of diversifying household incomes which, in turn, enhance households' food supply. The difference in educational level between the two sample groups (literate and illiterate households) is found to be statistically significant at less than 5 percent significance level. On average, the proportions of literate food secure household heads are larger than the proportion of literate food insecure household heads. The chi-square test confirms that there is a strong and negative association between the status of food insecurity and level of education. This finding coincides with theories and empirical findings of kidane et al (2005) and Frehiwot (2007).

Coping strategies index

Coping strategies are bundles of poor people's responses to declining food availability and entitlement in abnormal seasons or years. As presented in table 4 the mean values of the coping strategies index of the food insecure and secure sample households are found to be 38.2325 and 6.2576, respectively. The mean difference of coping strategies index of the two groups is significantly different from zero at 1 percent significant level. The higher the value of coping strategies index the more food insecure the household will be. The result of the coping strategy index indicates that, on average, the food insecure sample households took many and/ or more severe coping mechanisms than the food secured households so as to cope-up food shortage.

Table- 4: Summary Statistics of Coping Strategy Index

	Food Secure		Food Insecure		t-value
	Mean	**SD**	**Mean**	**SD**	
Coping Strategies Index	6.2576	15.7026	38.2325	29.4472	8.168***

Source: Survey Data, 2011
Note: *** Significant at 1% significance level

Table 5 summarizes the list of coping strategies household adopt in the study area in response to food shortage. Of the different coping mechanisms listed, selling household asset, leaving the entire days without eating and sending household members to beg are among the most severe responses that households adapt in the study area. Coping strategies such as drop out of children from schooling, eating seed stock and selling fire wood and/or charcoal are also common responses which could have a long run negative effect on the food security status of households in particular and the entire society in general.

Dropping children out of schooling so as to solve the short term food shortage will complicate the future chances of the youngsters. Selling fire wood and/ or charcoal to crack the current household food supply problem, on the other hand, will eventually leave the environment degraded and make it more vulnerable to soil erosion and prone to continuous drought which further exacerbates the existing problem of food insecurity in the study area.

Table 5: List of Coping Strategies Household Food Insecurity in the Study Area

List of Local Coping Strategies	Frequency	Percentage
1. Dietary Change		
▸ Eating less preferred food items	81	45.00
2. Short-term measures to increase household food availability		
▸ Borrow food from Neighbors or relatives	47	26.11
▸ Purchase food on Credit	16	8.89
▸ Consume seed stock	23	12.78
▸ Selling firewood or charcoal	13	7.22
▸ Participating on off farm income generating activities	35	19.44
▸ Selling household assets	81	45.00
▸ Drop out of children from school	51	28.33
3. Short-term measures to decrease numbers of people to feed		
▸ Send children to eat with neighbors	51	28.33
▸ Send some household members to beg	32	17.78
4. Rationing, or managing the shortfall		
▸ Reduce number of meals eaten in a day	43	23.89
▸ Skipping the entire day without having food	45	25.00
▸ Restrict consumption by adults in order for small children to eat	20	11.11

Source: Survey Data, 2011

Magnitude of household food insecurity

Understanding the incidence, depth, and severity of different dimensions of food insecurity is a fundamental policy tool in the government's undertaking towards food insecurity reduction and eventual eradication. Therefore, in this section, detail discussions of incidence, depth and severity of food insecurity among the rural sample households following the FGT index has been made here below.

For this purpose, as it has been discussed before, absolute food poverty line of ETB 1634.75 expenditure per adult per annum is employed, using 2200kcal per adult per day as the minimum calorie requirement for an adult individual to lead a healthy and active life. Sample households whose food expenditure per adult per annum greater than and equal to, ETB 1634.75, are deemed to be food secure, otherwise not. Furthermore, following Dercon, (1997), food poverty lines can be constructed at different minimum kilo calorie requirements per adult per day so as to investigate the extent and magnitude of household food insecurity in more detailed manner. Of these, 1650 kcal per adult per day and 2750 kcal per adult per day are the most commonly used minimum calorie requirements as measurement of extreme food insecurity and moderate food insecurity levels, respectively. Thus, following the cost of basic needs approach, it is found that ETB 1226.04 and ETB 2043.60 per adult per annum are the minimum level of expenditure per adult equivalent per annum needed to classify households in study area as extremely and moderately food insecure, respectively.

Table 6: FGT Results of Food Insecurity Estimates of Different Food Poverty Lines

Types of Food Insecurity	Head Count Index(α=0)	Food Insecurity Gap (α=1)	Severity of Food Insecurity (α=2)
Moderate food insecurity	0.8222	0.2998	0.1334
Absolute food insecurity	0.6333	0.1882	0.0699
Extreme Food Insecurity	0.3833	0.0720	0.0210

Source: Survey Data, 2011

Head count index: It is the share of sample households whose food expenditure per adult equivalent is below the food poverty line. That is, the share of population that cannot afford to buy the basic basket of food items. The food insecurity incidence in study area is 63.33 percent at the absolute food poverty line, i.e., ETB 1634.75 (Table 6). At the moderate food poverty line, i.e., ETB 2043.60 per adult per annum, the food insecurity incidence is found to be 82.22 percent. But, at the extreme food poverty line, i.e. ETB 1226.04 per adult per annum, the head count index in the study area is 38.33 percent.

Food insecurity gap index: This index provides information on how much insecure the food insecure households are relative to the food poverty line. It reflects the per capita cost of eliminating food insecurity, assuming perfect targeting of resources. The overall food poverty depth at the absolute food poverty line ETB 1634.75 per adult per annum is around 0.1882. Meaning that the administration of rural Woreda Adwa has to mobilize resources equal to about 18.82 percent of the food poverty line and distribute it to every individual so as to bridge the food gap under the assumption of perfect targeting. In other words, the food gap or the average of total consumption needed to bring the entire food insecure households at least at this food poverty line is 18.82 percent of food poverty line. The food insecurity gap at the moderate food poverty line, ETB 2043.60 per adult per annum, is estimated to be 0.2998 which means that the Woreda Administration need to mobilize resources equal to around 29.98 percent of the moderate food poverty line and distribute it to every individual in the amount in order to bridge the food gap.

Food insecurity severity index: It takes into account not only the distance separating the food insecure from food poverty line, but also inequality among the food insecure. Higher weight is assigned to households far away from the food poverty line. At the absolute food poverty line; ETB 1634.75 per adult per annum; the result indicates that food insecurity severity index is 0.0699. This means that there is about 6.99 percent of relative deficiency among food insecure households in the study area. At the extreme food poverty line; ETB 1226.04 per adult per annum; the food insecurity severity index is 0.0210, meaning there is about 2.10 percent relative deprivation among food insecure households in the study area.

Decomposing food insecurity index among different variables

The incidence, depth and severity of food insecurity can be decomposed with some demographic and socio-economic characteristics of households. Decomposing

through different demographic and socio-economic variables helps policy makers to understand the extent, depth and severity of food insecurity in detail and to act accordingly.

In table **7**, decomposition of food insecurity measures is summarized on the basis of sex of household head, family size, educational status of household head, fertilizer utilization, irrigation, access to credit, agricultural extension service, off farm income, safety net program participation and crop disease incidence at the absolute food poverty line, ETB 1634.75.

The head count index indicates that food insecurity incidence increases with family size. The head count ratio for households whose family size is one, is found to be zero percent. In contrast, the head count ratio of households whose family size is greater than nine, is 100 percent. This result signifies the fact that food insecurity incidence correlates positively with family size and it is in line with the empirical findings of MOFED (2007). The food insecurity gap ranges from zero percent to 36.62 percent which implies that the amount of financial resources required to pull them out to the level of food poverty line is greater if the number of family size is larger and vice versa. Moreover, the food insecurity severity index also indicates that the material deficiency increases with family size.

The head count index shows that 42.86 percent of female headed households do not fulfill their minimum calorie requirement. Furthermore, about 67.11 percent of male headed households lead their life without attaining their minimum calorie intake. From this it can be concluded that the male headed households live in greater undernourishment than their female counterparts. This finding confirms MOFED (2007) report which state that the poverty head count index of 32.7 percent and 40.6 percent of female and male headed households, respectively. Moreover, in table 7 the food insecurity gap indices of female and male headed households are 11.19 percent and 20.22 percent, respectively. This means, on average, male headed households need more financial resources than female headed once to bring them to the absolute food poverty line. Finally, the food insecurity severity indices of female and male headed households are 3.82 percent and 7.56 percent, respectively. This indicates that male headed households are more materially unsecured than their female counterparts.

Table 7**:** Decomposing Food Insecurity Indexes among Different Variables

List of Variables	Head Count Index		Food Insecurity Gap		Food Insecurity Severity	
Household head sex	**Index**	**SE**	**Index**	**SE**	**Index**	**SE**
Female	0.4286	0.0938	0.1119	0.0304	0.0382	0.0144
Male	0.6711	0.0382	0.2022	0.0152	0.0756	0.0271
Family Size						
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-4	0.2000	0.0678	0.0295	0.0119	0.0058	0.0026
5-8	0.6870	0.0434	0.1964	0.0166	0.0702	0.0084
>9	1.0000	0.0000	0.3662	0.0267	0.1540	0.0200
Household Head Educ.						
Literate	0.5428	0.0597	0.1587	0.0224	0.0600	0.0114
Illiterate	0.6909	0.0442	0.2069	0.0175	0.0760	0.0089
Fertilizer Utilization						
Yes	0.6348	0.0362	0.1892	0.0139	0.0705	0.0071
No	0.5000	0.3545	0.0990	0.0702	0.0196	0.0139
Irrigation Access						
Yes	0.6119	0.0597	0.1721	0.0213	0.0598	0.0100
No	0.6460	0.0451	0.1977	0.0181	0.0758	0.0095
Credit Access						
Yes	0.6235	0.0373	0.1883	0.0144	0.0703	0.0072
No	0.8000	01268	0.1865	0.0532	0.0629	0.0324
Agricultural Ext.						
Yes	0.6257	0.0371	0.1898	0.0144	0.0711	0.0074
No	0.7778	0.1389	0.1574	0.0499	0.0471	0.0195
Off farm Income						
Yes	0.3816	0.0559	0.0990	0.0181	0.0346	0.0079
No	0.8173	0.0379	0.2533	0.0175	0.0957	0.0100
Safety Net Participation						
Yes	0.6732	0.0380	0.2025	0.0151	0.0757	0.0079
No	0.4074	0.0948	0.1069	0.0308	0.0368	0.0124
Crop Disease						
Yes	0.6074	0.0384	0.1847	0.0149	0.0699	0.0076
No	0.8823	0.0784	0.2211	0.0353	0.0699	0.0184

Source: Survey Data, 2011

With regard to educational status of household heads, the head count index indicates that 69.09 percent and 54.28 percent of illiterate and literate headed households tends to be food insecure. Households whose heads are illiterate are found to be more food insecure than their literate counterparts. The food insecurity gaps for the literate and illiterate groups are 15.87 percent and 20.69 percent, respectively. The food insecurity severity indices of literate and illiterate headed households are 6 and 7.6 percent, respectively which indicates that households with illiterate heads are more materially deprived than literate once.

The head count index reveals the fact that around 63.48 percent of households who use fertilizer as a farm input are unable to achieve the minimum calorie requirements. Whereas, only 50 percent of non users are incapable of meeting the minimum calorie requirement recommended. Surprisingly, the finding of this study shows that households who use fertilizer as farm input seems to be more prone to food shortage

than non users. The food insecurity gap index is 18.92 and 9.90 percent for fertilizer users and non users, respectively. This indicates that households who are fertilizer users tends to need more financial resources than non users to pull them out of food insecurity to level food poverty line. The comparison of the food insecurity severity index of users and non users also indicates that households who use fertilizer as a farm input tends to suffer more from material deficiency than their counterparts.

The head count index shows that 62.35 percent of households with irrigation access do not fulfill their minimum calorie requirement as compared to 64.6 percent of households that do not have access to irrigation facilities (table 7). The food insecurity severities of the households with irrigation access and with no irrigation access are 5.98 percent and 7.58 percent, respectively. This implies that households who do not have access to irrigation facilities are more materially deprived than their counterparts.

As far as credit access is concerned, the head count index reveals the fact that 62.35 percent and 80 percent of households with credit access and without credit access, respectively, are found to be under the food security cutoff point. This suggests that households without credit access are more exposed to state of being food insecure than others. Besides, food insecurity gap index of households with credit access and without credit accesses are found to be 18.83 percent and 18.65 percent, respectively. This means about 18.83 percent and 18.65 of the food poverty line is required to pull out them to threshold level point.

As per head count index around 62.57 percent of households covered with agricultural extension services in the area are not meeting the minimum calorie requirements as compared to 77.78 percent of households which aren't covered by agricultural extension services. It is recorded that households who do not have access to agricultural extension services relatively require fewer financial resources than their counterpart households covered by the agricultural extension services.

Larger proportions (81.73 percent) of households that do not generate income from off farm sources do not meet the minimum calorie requirement as compared to only 38.16 percent of households that generate income from nonfarm activities. It seems that food insecurity gap is more rampant in households without access to off farm income activities than their counterparts. The result also indicates that households who have access to off farm activities are less materially deficient than their counterparts.

Consumption inequality among households

For better understanding, depth and severity of household food insecurity need to be supported with the analysis of how income or expenditure is distributed among households (Soubbotina, 2004). The distribution of food expenditure among households in the study area is summarized in table 8.

The bottom 10 percent of households (more food insecure) spent only 4.31 percent of the total food expenditure per adult equivalent per annum of the study area. Whereas,

the top 10 percent of the sample households (more food secure) spent about 28.87 percent of the total food expenditure per adult equivalent per annum of the study area. Furthermore, the bottom 20 percent of the sample households in study area spent only 9.93 percent of the total food expenditure per adult equivalent and in contrast, the top 20 percent of the sample households spent more than 41 percent of the total food expenditure per adult equivalent. Moreover, the Gini coefficient for the sample households in the study area is estimated to be about 0.312 or 31.20 percent indicating a greater inequality among the households in the study area. This result is consistent with the empirical finding of Tassew, Hoddinott and Dercon (2008).

Table 8: Size Distribution of Households by Food Expenditure per Adult

Deciles Groups	Mean	Percentage of mean	Frequency
First Deciles	756.028	4.31	18
second Deciles	986.389	5.62	18
Third Deciles	1082.231	6.17	18
Fourth Deciles	1190.892	6.80	18
Fifth Deciles	1303.065	7.43	18
Sixth Deciles	1427.480	8.14	18
Seventh Deciles	1660.987	9.47	18
Eighth Deciles	1836.775	10.47	18
Ninth Deciles	2230.999	12.72	18
Tenth Deciles	5063.949	28.87	18
Total	**17,538.766**	**100.00**	**180**

Source: Survey Data, 2011

Determinants of household food insecurity: Logit estimate

In analyzing correlates of household food insecurity, the maximum likelihood estimate of binary logit model is employed. Pair wise correlation matrix is also applied to test the existence of the problem of multicollinearity. The test result showed that there is no serious multicollinearity problem among the explanatory variables. To avoid the effect of heteroscedasticity robust logistic regression is employed as it compromises the effect of heteroscedasticity even if it exists initially.

Different tests of goodness of fit validated that the model fits the data well. The Wald chi-square test robustly rejected the hypothesis that all coefficients are not different from zero. The Hosmer-Lemeshow test of goodness of fit also fails to reject the null hypothesis that the model fits the data well. Hence, the Hosmer and Lemeshow test statistic shows a significant association between the observed and the model's prediction of a household's food insecurity status.

The sensitivity, the number of food insecure households correctly predicted by the model is 94.74 percent. This all implies that the model under consideration fits the data very well and fairly.

Table 9: Estimation Result of Binary Logit Model

HHDFIST	Coeff.	Robust Std. Err.	P-value	Marginal effect(dy/dx)
AgrExt	-4.30**	2.25	0.056	-.23
Crdt	-1.31	1.01	0.194	-.14
Ferti	3.35*	1.79	0.061	.68
Irig	-.30	.67	0.654	-.05
Offarminc	-3.68***	.73	0.000	-.62
HHeduc	-.23	.74	0.752	-.04
Oxen	-.79**	.38	0.037	-.13
HHsex	.65	.83	0.435	.12
Age	.04	.03	0.233	.01
Totlndsiz	-8.03***	1.68	0.000	-1.27
SNPP	-3.03***	.70	0.000	-.48
Cropdises	2.66**	1.35	0.049	.42
FmsizAE	1.54***	.27	0.000	.25
AgedepRatio	.88*	.47	0.060	.14
Constant	.32	2.77	0.909	-
Number of Obs =180			Wald chi2(14) = 49.24	
Log pseudo Likelihood =- 46.134017			Prob > chi2 = 0.000	
Sensitivity[1] = 94.74 %	Specificity[2] = 81.82%		Count R^2 = 90.00%	

Source: Own Survey Data, 2011

Note: ***, **,* represent level of significance at 1%, 5% and 10% respectively

In the model, fourteen explanatory variables are included. Of which nine variables are found to be important determinant factors of household food insecurity in the study area. These are discussed one by one in detail as follows;

Family Size (FmsizAE): Family size measured in adult equivalent tends to be positively related to household food insecurity and it is statistically significant at 1 percent level of significance. The positive sign implies that the probability of being food insecure increases with an increase in family size. The marginal effect corresponding to the family size is 0.25 indicating the fact that as the family size increases by one more adult equivalent, the probability of being food insecure increases by 25 percent, other things are held constant. This result is consistent with findings of Abebaw (2003), Genene (2006), Ayalneh (2009), and Tsegay (2009).

Fertilizer (Ferti): Fertilizer is found to be positively related to household food insecurity though it is significant only at less than 10 percent significance level. This result is against prior expectation of the researchers and empirical findings of Kidane, et al. (2005) and Tesfaye (2005). The marginal effect shows that, the probability of households' food insecurity increases by about 68 percent if the households use fertilizer as a farm input, holding all other things constant. Such unexpected result may be due to the relative high price of fertilizer that drains the financial resources of

[1] Correctly predicted food insecure households based on a 50% probability classification

[2] Correctly predicted food secure households based on a 50% probability classification

households without significant improvement in the crop yield, particularly when it is not used in the right amount. Moreover, considerable section of farmers in the study area, are forced to purchase fertilizer to ensure their participation in the safety net program. During the survey it was observed that fertilizer is sold in the local market just like any other household commodities. This reveals important fact that those farmers who have compiled to buy fertilizer resell it in the local market to smooth their day to day food consumption need. Such practice tends to affect the rate and time of application of fertilizer which in turn reduces the productivity of fertilizer. Moreover, the households purchase and utilization of fertilizer and other inputs are influenced by households' socio economic characteristics. Adam et al (2011) reported that, smallholders' farm households' participation in fertilizer purchases was influenced by household characteristics including sex and experience of the household head, family size and participation in crops sales; institutional arrangements including credit and agricultural extension service; and, environmental factors including differences in location and wealth status in terms of livestock size.

The finding of this study is, however, consistent with the empirical findings of Zenebe et al. (2004) and Abedullah et al. (2007). Zenebe et al. (2004) in their study on technical efficiency of peasant farmers in northern Ethiopia found out that modern[3] input utilization was contradictory to their expectation. They concluded that emphasizing on increased use of external inputs might not be worthwhile for typical dry land areas.

Age dependency ratio: The probability of household being food insecure will increase with an increase in the number of age dependents of family members. This finding is in accordance with the prior expectations of the researchers. The marginal effect shows that as the age dependency ratio increases by one more member the probability of being food insecure increases by 14 percent, other things are held constant. This result is in conformation with the economic theory and empirical findings of Genene (2006).

Crop disease incidence (Cropdises): The most common crop diseases incidences in the study area are 'Metselem' and 'Ahmodia'. The former seriously affects the productivity of barely and the latter affects the productivity of Sorghum, 'Teff' and 'Hanfets' which are the dominant crops in the study area. The incident of such diseases directly affects household food insecurity. It is also statistically significant at 5 percent level of significance. The result showed that the probability of being food insecure increases by 42 percent if households are vulnerable to crop disease incidences, holding all other things constant.

Safety net program participation (SNPP): The objective of the overall safety net program is to protect asset depletion at the household level and create communal assets at the community level. This program has two components; labor- intensive

[3] refers to fertilizer and improved seeds

public works and direct support for labor-poor households. The able bodied are engaged in public works for which they are paid a minimum amount, while the labor poor are provided the same amount freely. This variable is statistically significant at 1 percent significance level with negative sign. Households who participate in the safety net program are more likely to be food secured as they obtain food and /or cash aid. The marginal effect of this variable is about -0.48 meaning the probability of being food insecure decreases by 48 percent if the household has access to safety net program, holding other variables constant. The finding is consistent with the empirical findings of Kaloi, Tayebwa and Bashaasha (2005).

Total land size holding (TotIndsiz): The size of the arable land that household possess is statistically significantly affects the household's food insecurity status at 1 percent significance level with negative sign. The negative sign shows that, household who own larger size farm land is more likely to be food secured than those with relatively smaller size farm land. The marginal effect of this variable is that as the land size holding increases by one more hectare the probability of being food insecure decreases by 127 percent, other things held constant. The finding is in line with the prior expectation of the researchers and empirical findings of Mulugeta (2002), Tesfaye (2003), Abebaw (2003), Kidane, et al (2005), Tesfaye (2005); and, Veen and Tagel (2011).

Oxen ownership (Oxen): Households ownership of oxen is also significant at less than 5 percent significance level with negative sign. In developing economies like Ethiopia, traditional farming system is the mainstay of their citizens. In such farming system oxen serve as a source of traction and hence significantly affect household's crop production. A household who owned an ox is more likely to be food secure than those without ox. According to the finding the probability of being food insecure decreases by 13 percent if the household owned one more additional ox, other things held constant. This is again in line with the finding of Kidane et al (2005).

Off farm income (Offarminc): In this study off farm income refers to the income generated from natural gums collection, daily laborer, serving as guardian and traditional gold mining activities. It is statistically significant at less than 1 percent with a negative sign. It is in conformation with prior expectation and the findings of Frehiwot (2007). The more the household has opportunity of participating in off farm income generating activities, the more it will be food secured with a marginal effect of -0.62. The probability of being food insecure decreases by 62 percent if the household has access to off farm income generating activities, holding other things constant. However, Adam et al (2010) reported that off-farm wage labor employment has been working against increased productivity of the smallholder farm households.

Agricultural extension service (AgrExt): It is significant at less than 5 percent significance level with a negative sign. The households who obtained training and advisory services on how to use fertilizer, improved seeds and other agricultural technologies are less likely to be food insecure with a marginal effect of 0.2279

implying that the probability of being food insecure decreases by 23 percent if the household has access to agricultural extension services, holding all other variables constant.

In a nut shell, the findings of this study showed that household food insecurity in rural areas is still pervasive as larger proportion of the households (63.33% of the household) in study area are food insecure. If food aid was not in place in the study area, the incidence of food poverty would have been more severe than it was with food aid. That is, it would have been raised nearly by 9.5%.

The determinants of household poverty essentially are linked with the family size, size of farm land and access to extension services. This result shows that off farm income and ownership of farm animal specifically oxen are critical in reduction of food insecurity in the study area. Similarly, access to extension services, which is currently the huge public investment in the country, is confirmed to play an important role in enhancing household food security.

Yet another finding of this paper is that fertilizer utilization, in the study area, is identified as deteriorating factor of household food security. This is against the prior expectation of the researchers and different empirical findings. This reminds the policy makers the fact that extension service yet has to deliver a meaning full improvement in the area of fertilizer utilization in the dry land areas of rural Ethiopia.

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