Determinants and Coping Strategies of Household Food Insecurity
Evidence from Agro Pastoralists of Afar Region (Zone Two)

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Abstract

This research is conducted in Zone two of Afar Region with objective of identifying the major determinants of household food insecurity and listing out of local coping strategies. To achieve the specified objectives, both primary and secondary data sources were used. Primary data were collected from four Kebelles through structured questionnaire. To analyze the collected data both descriptive and inferential analysis were employed. In the case of inferential analysis binary logit model was used. Furthermore, indices such as Foster, Greer and Thorbecke (FGT), Gini Coefficient, Lorenz Curve and Coping Strategy Index were also usedAbsolute food poverty line for the study area is found to be ETB **2,828.64** per adult per year. The incidence, depth and severity of food insecurity are found to be 35.67 percent, 10.65 percent and 4.72 percent, respectively. The most severe coping mechanisms households took include selling household asset and dropping children out of schooling. Access to agricultural extension services, participation in safety net program and educational status of household are identified as negative and significant determinants of household food insecurity. In contrast, sex of household head and family size are found to be positive and significant covariates of household food insecurity. To meet the first Millennium Development Goal (MDG), i.e., eradicating extreme poverty and hunger in the study area to the target level, greater focus should be given on creating off farm income generating activities, constructing dams for irrigation and improving the current agricultural advisory services in intensity and coverage.
Keywords: Food Insecurity, Coping Strategies, Binary Logit and Zone Two

1. Introduction

Food security is fundamental element in human existence. Without food, nothing happens: no economic growth, no science and technology, no music and literature, not even reproduction (Asefach and Nigatu, 2007).

"*The biggest killer disease in Africa is neither malaria nor HIV/AIDS. Poverty is the biggest killer disease in our continent. It kills and maims millions both directly and through its facilitative role of other killer diseases," Meles* [3] *(2010).* In Africa Chronic food insecurity affects about 200 million people who are suffering from malnutrition.

According to MOFED 2012 the highest poverty incidence is recorded in rural Afar followed by Somali and Tigray regional states, that is, 36.10 percent, 32.80 percent and 31.80 percent respectively. Furthermore; the same source indicated that in regional rural Afar the food poverty incidence is estimated to be 33.90 percent which is greater than the national rural average.

Therefore, as the issue of food insecurity is a burning agenda both at national and international levels, conducting studies on this issue will contribute to the current debate on food insecurity. Hence, this research work has been designed to address the following questions:

- Who are the food insecure households in the study area?
- How much is the extent and severity of household food insecurity?
- Is food expenditure inequality severe problem in the study area?
- What determines household food insecurity in the study area?
- What are the local coping strategies of households when they face problem of food deficit?

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3. Materials and Methods

3.1. Data Sources and Method of Data Collection

To attain the research questions, data were collected both from primary and secondary sources. A cross sectional primary data were collected from selected households in the study area through structured questionnaire.

3.2. Method of Data Analysis

3.2.1. Determination of Food Poverty Threshold Level

Economic theorists provide us a number of methods to determine the food security threshold point; of the methods the most widely used ones are Direct Calorie Intake (DCI), Food Energy Intake (FEI) and Cost of Food Needs (CFN) approach.

Following the CFN approach, identifying the poorest 50% of the sample population as a reference group (Households) is the first step, assuming that in the study area food insecurity (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 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 17 food items. The calorie value of each food items was 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:

$$\sum q_i Kcal_i = T^* \text{, with } T \cong T^{*'} \text{. But } T^{*'} \neq T \text{ -- [3.2]}$$

Where T^* = total calorie obtained by0 individual adult from consumption of the average quantities.

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

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

T = recommended calorie per day per adult equivalent (2200 kilocalorie)

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

3.2.2. Measurements of Food Insecurity Profile

The Foster, Greer and Thorbecke (FGT), (1984), class of decomposable food insecurity measure.

The FGT (1984) class of food poverty measure can be presented as follows

$$P(C_j, Z, \alpha) = \frac{1}{N} \sum_{j=1}^{n} \left[\frac{(Z - C_j)}{Z} \right]^{\alpha} \text{-- [3.3]}$$

Where **Z** refers to the food poverty line, **C_j** is the welfare indicator for household **j** measured 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 shown.

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., the depth of food insecurity.

Food Insecurity Severity Index: if α = 2 then, FGT measures the severity of food insecurity. It is sensitive to the inequality among the food insecure households.

3.2.3. Measuring Expenditure Inequality and Food Insecurity

Measuring income inequality is broader than food insecurity since it focuses on the entire population rather than only on the food insecure households. The commonly used method is to divide the population into successive deciles (tenths). Furthermore, to know food expenditure inequality in the study area, the researchers applied the Lorenz curve. It is defined as follows (Araar, 2006):

$$L(P) = \frac{\int_0^p Q(q)dq}{\int_0^1 Q(q)dq} = \frac{1}{\mu}\int_0^p Q(q)dq \text{ -- [3.4]}$$

In equation 3.4 the numerator sums the expenditure per adult per annum of the *p* proportion (the poorest 100*p* %). 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.

3.2.4. Coping Strategies Index

Following Maxwell, D. and Caldwell, R., 2008, a set of simple questions can be developed to capture people's basic consumption-related coping responses to inadequate access to food in a given culture or location. The following steps are important while constructing the coping strategies:

Step -1: Coping Behavior: Getting the Right list for the Location

The first step in the design process is to identify the locally relevant coping strategies in the study area. These falls into four basic categories: Dietary change, short-term measures to increase household food availability, short-term measures to decrease numbers of people to be feed and rationing, or managing the shortfall

Step-2: Frequency: Counting the Frequency of Strategies

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 here in this study are based on seven-day recall period.

Step -3: Severity: Categorizing and Weighting the Strategies

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.

Step-4: Scoring: Combining Frequency and Severity for Analysis

To be able to conduct an 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.

It can be summarized by the following formula:

$$CSI = \sum_{i=0}^{k} F_i S_i \text{ -- [3.5]}$$

Where ; F_i = Frequency of the ith 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 in each sample Kebelle were conducted

3.2.5. Model Specification

Since the dependent variable of the model; status of household food insecurity; is a binary categorical variable. Logit model was employed owing to its advantage in analyzing the determinants of household food insecurity. It is given by the following formula:-

$$P_i = f(Zi) = f(\alpha + \beta i Xi) = \frac{1}{1 + e^{-(\alpha + \Sigma \beta i Xi)}} \text{ -------------------------------------}$$
[3.6]

Where e = is the base of the natural logarithm

X_i = stands for the ith explanatory variables

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

β_i = is parameters to be estimated

α =constant term of the logistic regression function

$$Z_i = \alpha + \beta_i X_i$$

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).***

$$Y_i = \alpha + \sum_{i=1}^{k} \beta_i X_i + \mu_i$$

-- [3.7]

Where: K= the number of explanatory variables; Yi= the log odds ratio in favor of household being food in

secure; Xi= vector of independent demographic and socio-economic variables of households and *μ*=the error term of the model.

4. RESULTS AND DISCUSSION

4.1. Food Insecurity Status of Households

Once the threshold food expenditure per adult per annum was determined following cost of food needs; households are categorized into food secure and insecure groups. This is done by comparing the sample households' food expenditure per adult equivalent per year against the minimum level of expenses required to ensure survival. The absolute food poverty [1]line is found to be **ETB 2,828.64** per adult per annum; which is considered as the minimum expenditure an adult individual in the study area is needed to lead healthy and active life. Therefore, those sample households whose food expenditure per adult per annum greater than and equal to **ETB 2,828.64** are designated as food secure otherwise insecure. Accordingly, it is found that ***35.67%*** of the total respondents in study area are found to be food insecure. This finding specifies that food poverty incidence, in the study area, is greater than the regional rural food poverty incidence (MoFED, 2012).

4.1.1. Demographic and Socio-Economic Characteristics of Sample Household

Table 4.1: Household Food Security Status and Its Characteristics (Continuous variables)

List of Variables	Total Sample(n=157)		Food Insecure (№=56)		Food Secure (№=101)		t- value
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	
Family size(in Adult Equivalent)	5.444	2.167	6.995	*1.7598*	*4.584*	*1.8788*	*7.8765****
Age of the Household Head	*50.350*	*12.565*	*53.873*	*11.294*	*48.238*	*12.736*	*2.7451****
Age dependency ratio	*0.7636*	*0.7305*	*0.6159*	*0.5900*	*0.8455*	*0.7886*	*1.9020**
Landholding per Household (Ha)	*2.1226*	*0.4722*	*1.7451*	*2.8423*	*2.8036*	*2.1823*	*2.6070***
Livestock holding (TLU)	*10.113*	*17.389*	*8.2237*	*23.6825*	*13.5204*	*12.3752*	*1.8422**
Oxen Ownership in Number	*1.185*	*1.131*	*1.0396*	*1.3200*	*1.4464*	*0.98424*	*2.1844***
Total Food Expenditure	*4078.12*	*2470.775*	*1982.886*	*590.373*	*5239.831*	*2347.384*	*10.1923****
Food Share	*0.811*	*0.077*	*0.7967*	*0.07385*	*0.8186*	*0.0791*	*1.6997**
Investment On Human Capital	*1106.981*	*1405.588*	*1082.964*	*1254.43*	*1120.297*	*1488.649*	*0.1589*

Note: ***, ** and* represents 1, 5 and 10 percent level of significance

Source: Own Survey Data, 2012

It was hypothesized that family size will have a negative influence on the food security status of household. In other words, as the number of household size increases the number of mouths waiting for food queue will increase and thereby aggravating food shortage. Hence, family size is one of the potential demographic variables that would have due contribution for household food insecurity. However, households having the same family size (measured in number) might require different food expenditure per person to fulfill the minimum calorie requirement depending up on the age and sex composition of households. This calls for the need of family size of households in terms of adult equivalent which takes in to account age and sex composition of households members in determining food expenditure needed per household. Table 4.1 indicates that the mean of adult equivalents for food secure and insecure are about 4.584 and 6.995, respectively. The t-test of the mean difference of family size between the two groups indicates that there is statistically significant difference at 1 percent level of significance. The overall mean family size (measured in terms of adult equivalent) is found to be 5.444. This figure is greater than the rural national **4.9** and rural regional **4.6** average family sizes. This implies that family size of the sample Kebelles in particular and in the agro pastoral Weredas 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 in line with prior expectation of the researchers and empirical findings of Abebaw (2003), Tesfaye (2003), Tesfaye (2005), Genene (2006), Frehiwot (2007) and Teklay (2011).

Theoretically, the current debate among scholars on the relationship between age of household head and food security status of households can be categorized in two major 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, forecast the weather conditions etc. Hence, she or he will be less prone to be food insecure with age. On the other hand, the second group of scholars point out that household head age and food security status is found to be inversely related; this is due to natural limit and sickness of individuals with age. Furthermore, in small and traditional farming activities households demand more physical labor than human capital which decreases with age. In this study, the mean age of overall sample household heads is found to be 50.350 with standard deviation of 12.565. Furthermore, the mean age of household heads for food insecure households is

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[1] absolute poverty refers to severe deprivation of basic human needs

53.87 years, and that of the food secure is 48.24 years of age. The result of the t-test confirmed that there is statistical significant difference between the mean ages of household heads of the two groups at 1 percent significance level. This analysis implies that the younger the household head is the more food secure will be and vice versa. This finding is consistent with the second group of scholars who argued that there is an inverse relationship between age of household head and household food security status. This finding gives meaning in the sense that traditional and small holder farming activity demand more physical labor which they lack with age due different reasons.

The mean food expenditure per adult of the sample households, in the study area, is found to be **ETB** 4078.12. Moreover, the mean food expenditure per adult for the food secure and insecure sample households is estimated to be **ETB** 5239.831 and **ETB** 1982.886, respectively. Hence, the mean difference of the two groups is statistically significant at 1 percent significance level.

Human capital is a term economists often use for education, health, and other human capacities that can raise productivity when increased (Todaro, 2003). It refers to the stock of skills and productive knowledge embodied in people. Any activity that increases the quality of workers is an investment in human capital. In this study, it is proxied by the amount of expenditure households made on health and education. Higher expenditure on these social services is considered as an increase in investment on human capital. The mean expenditure on education and medication for the food insecure and secure sample households are estimated to be **ETB** 1082.964 and **ETB** 1120.297, respectively.

It is important to note here that, had the households in the study area diverted their resources from human capital investment to food consumption expenditure at the absolute food poverty line (i.e. **ETB** 2828.64), food insecurity incidence would have been reduced from the current level 35.67 percent to 15.30 percent.

Table 4.2: Household Food Insecurity Status and Characteristics (Categorical Variables)

Categorical Variables		Food Insecure (%)		Food Secure (%)		χ^2
		Number	**Percent**	**Number**	**Percent**	
Sex of Household Head	Female	4	7.14	7	6.93	0.0025
	Male	52	92.86	94	93.07	
Educational Status of household Head	Literate	12	21.43	11	10.89	3.199*
	Illiterate	44	78.57	90	89.11	
Safety Net Participation	Yes	50	89.29	92	91.10	0.1356
	No	6	10.71	9	8.90	
Access to off farm income	Yes	25	44.64	67	66.34	1.8514
	No	31	55.36	34	33.66	
Access to Agricultural Extension Services	Yes	20	35.72	55	54.46	1.4287
	No	36	64.28	46	45.54	

Source: Own Survey Data 2012

 Note: * represents at 10 percent significance level

With the exception of educational status of household head all of the rest categorical variables listed in table 4.2 are statistically insignificant.

It was hypothesized that educational back ground of household head is expected to have a positive impact on the household food security status. This is because individuals who have access to modern education are less hesitant to accept changes (such as adoption of improved seeds, new way of farming, fertilizers etc) and enables them to read instructions on fertilizer, pesticides and weed killer package; and diversification of household incomes which, in turn, will enhance households' food supply.

4.2. Extent and 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 analyses and discussions of incidence, depth and severity of food insecurity among the rural sample households following the FGT index has been made.

For this purpose, as it has been discussed before, absolute food poverty line of **ETB 2828.64**, 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 2828.64**, 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 848.60** and

ETB 3535.81 per adult per annum are the minimum level of expenditure per adult equivalent per annum needed to classify households, in the study area, as extremely and moderately food secure or not, respectively.

Table 4.3: 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	0.5032	0.1721	0.0807
Absolute Food Insecurity	0.3567	0.1065	0.0472
Extreme Food Insecurity	0.0064	0.0004	0.00002

Source: Own Survey Data, 2012

Head Count Index: Table 4.3 indicated that, food insecurity incidence at the absolute food poverty line, **ETB** 2,828.64, in the study area is 35.67 percent. At the moderate food poverty line, **ETB** 3535.81 per adult per annum, the food insecurity incidence is calculated to be 50.32 percent. Besides, at the extreme food poverty line, **ETB** 848.60 per adult per annum, the head count index is found to be 0.64 percent.

Food Insecurity Gap Index: The result shows that overall food poverty depth at the absolute food poverty line **ETB 2828.64** per adult per annum is found to be 0.1065; means the administration of zone two should mobilize resources equal to about 10.65 percent of the food poverty line and distribute it to every individual in the amount needed 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 to the level of food poverty line is 10.65 percent of food poverty line. The food insecurity gap at the moderate food poverty line, **ETB 3535.81** per adult per annum, is found to be 0.1721. This shows that the administration of zone two should mobilize resources equal to about 17.21 percent of the moderate food poverty line and distribute it to every individual in the amount needed so as to bridge the food gap, at least theoretically.

Food Insecurity Severity Index: At the absolute food poverty line the result indicates that food insecurity severity index is 0.0472. This signifies that there is about 4.72 percent of relative expenditure deprivation among food insecure households in the study area. At the extreme food poverty line, i.e. **ETB 848.60** per adult per annum, food insecurity severity index is 0.000021, meaning there is about 0.0021 percent relative deprivation among food insecure households in the study area.

4.3. Measuring Consumption Inequality among Sample Households

To understand what life looks like in the study area; knowing the incidence, depth and severity of household food insecurity alone is not enough. It should be supported with analysis of how income or expenditure is distributed among households (Soubbotina, 2004). Thus, in this section attempts has been made to see how food expenditure is distributed among sample households in the study area.

Table 4.5 depicts that the bottom 10 percent of the respondent households (more food insecure) in the study area spent only 3 percent of the total food expenditure per adult equivalent per annum. Whereas, the top 10 percent of the sample households (more food secure) spent about 24.30 percent of the total food expenditure per adult equivalent per annum. Furthermore, the bottom 20 percent of the sample households in study area spent only 7.6 percent of the total food expenditure per adult equivalent. In contrast, the top 20 percent of the sample households spent more than 39.30 percent of the total food expenditure per adult equivalent. Thus, it can be inferred from table 4.5 that there is unfair expenditure/income distribution in the study area as only the small section of the society spent a lion share of the total food expenditure.

Table 4.4: Size Distribution Food Expenditure per Adult per annum of Households

Deciles Groups	Mean	Percentage of mean	Frequency
First	1227.52	3.00	16
second	1888.81	4.60	16
Third	2433.30	6.00	16
Fourth	2851.00	7.00	15
Fifth	3265.75	8.00	16
Sixth	3880.43	9.40	16
Seventh	4460.66	10.70	15
Eighth	4914.66	12.00	16
Ninth	6169.73	15.00	16
Tenth	10,007.11	24.30	15
Total	**41,098.97**	**100.00**	**157**

Source: Own Survey Data, 2012

Theoretically, the extreme values of the Gini Coefficient are 0 and 1. A value of Gini coefficient very close to zero specifies better expenditure/income distribution while a value of Gini coefficient very to one

indicates unfair expenditure/income distribution among households .The Gini coefficient for the sample households is found to be about 31.30 percent. This implies that there is moderate expenditure inequality among the households in the study area. This result is somewhat consistent with the empirical findings of Tassew, Hoddinott and Dercon (2008) and MOFED (2012).

4.4. Estimation of the Determinants of Household Food Insecurity
So far we have tried to characterize households based on different demographic and socio-economic factors; to measure the extent and severity of food insecurity; and to quantify expenditure inequality among the sample households using different descriptive analysis and indices.

On the other hand, in this section attempts have been shifted towards explaining the main demographic and socio-economic determinants of household's food insecurity which is beyond the scope of descriptive analysis and other indices. Hence, in analyzing correlates of household food insecurity, econometricians suggest that binary Logit model as the most plausible one among others. Thus, the researchers are going to present and interpret the estimation result of the binary Logit model.

Various goodness-of-fit measures validate that the model fits the data well. The log likelihood ratio test robustly rejects the hypothesis that all slope coefficients are simultaneously equal to zero and thus, the model correctly predicted the observations (see table 4.6 below). Furthermore, the count R^2 for the binary logit model is found to be 80.89 percent implying that the logistic model correctly predicted 80.89 percent (127) of the total sample households. Besides, the sensitivity, the number of food secure households correctly predicted by the binary logit model is 88.12 percent and specificity, the number of food insecure households correctly predicted is 67.86 percent of the observations. Thus, the binary logit model under consideration fits the data very well and fairly.

Table 4.5: *Estimation Result of Binary Logit Model*

FSST	Odds Ratio	Std. Err.	P-value
AnmDis	1.326	1.110	0.736
SNPPY	0.1829*	0.167	0.063
AgrExtY	0.4601*	0.216	0.098
SexHF	6.754**	6.592	0.050
HHedu	0.247**	0.168	0.040
TLU	1.007	0.019	0.692
FmszAE	2.304***	0.349	0.000
DisMKT	0.8782	0.097	0.241
FlndSiz	1.033	0.125	0.791
AgE	1.040	0.025	0.104
Pseudo R^2 = 0.3650		**Number of Observation =157**	
LR chi2 (10) = 74.67		**Prob > chi2 = 0.0000**	
Sensitivity[1] = 88.12% Specificity[2] = 67.86%		**Count R^2 = 80.89%**	

Note: ***, **,* represent level of significance at 1%, 5% and 10% respectively
Source: Own Survey Data, 2012

In this binary Logit model, ten explanatory variables are included; of which five variables are found to be significant determinant factors of household food insecurity in the study area. These include, safety net program participation (SNPPY), agricultural extension services (Agr.ExtY), household head sex (SexHF), family size in adult equivalent (FmszAE), and household educational status (HHedu).

Family Size (FmsizAE): In line with prior expectation, family size measured in adult equivalent is found to be positively related with household food insecurity and it is estimated to be statistically significant at 1 percent level of significance. The positive relationship implies that the odds ratio in favor of being food insecure increases with an increase in family size and vice versa. This means as the family size increases by one more adult equivalent, the odds ratio in favor of being food insecure increases by a factor of 2.304, assuming other things are held constant. This result is consistent with findings of Abebaw (2003), Genene (2006), Tsegay (2009) and Ayalneh (2009).

Safety Net Program Participation (SNPP): The overall objective of 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 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

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

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

amount for free. This variable is statistically significant at 10 percent significance level. Hence, households who get an opportunity to participate in the safety net program are more likely to obtain food and /or cash aid which might help them to enhance their food supply and/or purchasing power and thereby making them more food secure among others. The odds ratio of being food insecure for those households who participate in the safety net program decreases by a factor 0.183, holding other variables constant and vice versa. This result is in conformation to the empirical findings of Kaloi, Tayebwa and Bashaasha (2005).

Agricultural Extension Service (AgrExt): It is significant at less than 10 percent significance level and has negative sign. It is in line with prior expectation of the researchers. That is, households who obtained training and advisory services on how to use improved seeds and other agricultural technologies are less likely to be food insecure. As depicted in table 4.6 the odds ratio of being food insecure decreases by a factor of 0.460 if the household has access to agricultural extension services, holding all other variables constant.

Sex of Household Head (SexHF): the odds ratio of households being food insecure increases by a factor of 6.754 if the household headed is by female, holding other variables constant. It is statistically significant at 5 percent significance level. This is in line with the general view that male has better physical endurance and capacity in farm activity unlike female counterpart. This is mainly due to the fact that agricultural activities demand higher physical effort and take more time. But, females have additional responsibilities inside their home besides to farming activities.

Household Educational Status (HHedu): It was hypothesized that educational back ground of household head is expected to have a positive impact on the household food security status. This is because individuals who have access to modern education are less hesitant to accept changes (such as adoption of improved seeds, new way of farming, fertilizers etc) and enables them to read instructions on fertilizer, pesticides and weed killer packages. In this study however; in contrast to the prior expectation of the researchers; the odds ratio of households being food insecure decreases by a factor of 0.247 if the household is headed by illiterate one. This finding is inconsistent to the prior expectation of the researchers.

4.6. Analysis of Coping Strategies

Table 4.6: List of Coping Strategies in the study area

List of Local Coping Strategies		Frequency	Percentage
1.	**Dietary Change**		
	▶ Eating less preferred food items	68	43.31
2.	**Short-term measures to increase household food availability**		
	▶ Borrow food from neighbors or relatives	57	36.31
	▶ Consume seed stock	46	29.30
	▶ Selling firewood or charcoal	50	31.85
	▶ Participating on off farm income generating activities	59	37.58
	▶ Selling household assets	75	47.77
	▶ Drop out of children from school	51	32.48
3.	**Short-term measures to decrease numbers of people to feed**		
	▶ Send children to eat with neighbors	25	15.92
4.	**Rationing, or managing the shortfall**		
	▶ Reduce number of meals eaten in a day	55	35.03
	▶ Restrict consumption by adults in order for small children to eat	43	27.39

Source: Own Survey Data, 2012 Table 4.7 reveals list of coping strategies that households in the study area used to take so as to cope up with food shortage. About 68(43.31%) of the sample households resort on less preferred[1] food items in cases they faced with food shortage. In addition, about 75(47.77 %) of the sample household on the other hand rely on selling household assets so as to cope up food shortage. Of these different coping mechanisms listed below selling household asset, dropping children out of schooling, eating seed stock and selling fire wood and/or charcoal are also common responses which could have a long term negative effect on the food security status of households in particular and the entire society in general. Dropping children out of schooling to solve the short term food shortage will mess up the future chances of the youngsters. This also reduces the future human capital resource of the society under consideration in particular and the country in general. Selling fire wood and/ or charcoal on account to solve the current household food supply problem, on the other hand, will finally leave the environment empty and make it more vulnerable to soil erosion. This in turn may make the region more prone to continuous drought which further intensifies the existing problem of food

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[1] Refers to serving "Kollo" as dinner or lunch, having dinner or lunch without Soup etc

insecurity in the study area.

Table 4.7: Summary Statistics of Coping Strategy Index

	Food Secure(n=101)		*Food Insecure(n=56)*		*Total sample(N=157)*		*t-value*
Coping Strategies	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	
	8.76	5.23	28.25	11.24	15.72	8.56	5.754***

Source: Own Survey Data, 2012

Note: *** significant at 1 % significance level

Table 4.7 reveals the mean values of the coping strategies index of the food insecure and secure sample households are found to be 28.25 and 8.76, respectively. The higher is the value of coping strategies index the more food insecure the household is and vice versa. The t- test for the mean difference of coping strategies index of the two groups is statistically significantly different from zero at 1 percent significant level. Implying that, on average, the food insecure sample households took many and/ or more severe coping mechanisms than their counterpart households did so as to cope up with food shortage.

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