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Food Insecurity and its Determinants in Households of Ethiopia: The Case of Libo Kemkem District, Amhara National Regional State

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Abstract
The existence and impact of food insecurity problem is severe in Ethiopia. The aim of this study was to estimate the food insecurity situation and identify its determinants. The study was conducted in 2014 at Libo Kemkem District of Amhara National Regional State in Ethiopia by a survey of 213 sample households. Descriptive statistical analysis and binary logistic regression were used to analyze the data. The minimum level of food expense required per adult equivalent (AE) per year was used to measure the food insecurity situation. Based on the local market, this level was determined as 2,700 Birr per AE per year. The result of the survey revealed that half of the households covering 50.7 percent were food insecure. Out of the 12 variables included in binary logistic regression model, 5 variables were found with significant impact on determining the household food insecurity situation. These variables were soil fertility problem, participation in safety net program (PSNP), age of the household head, total assets and income. Based on the study findings food security building interventions recommended focusing on statistically significant areas.
Keywords: Food insecurity, expenditure, Binary logistic, *Birr*, Ethiopia

1. Introduction

Food security is a broad and cross-cutting issue having implication for a number of different sectors in the economy. Food security has traditionally been associated with the provision of emergency foreign aid during periods of severe natural or man-made crisis. More recently, however, the concept of food security has been broadened to incorporate the capacity of households to procure adequate levels of basic necessities in a sustainable fashion, and the ability of households and individuals to use this food properly (MoARD, 2007).
A total of 842 million people in 2011-13, or around one in eight people in the world, were estimated to be suffering from chronic hunger, regularly not getting enough food to conduct an active life. Even if there is overall progress, marked differences across regions persist. Sub-Saharan Africa remains the region with the highest prevalence of undernourishment, with modest progress in recent years (IFAD *et al.,* 2013).

Despite a fast-growing economy, Ethiopia remains one of the poorest countries in the world. It experiences high levels of both chronic and acute food insecurity, particularly among rural populations and smallholder farmers. Approximately 44% percent of children under 5 years of age in Ethiopia are severely chronically malnourished, or stunted. As of January 2014, the Government of Ethiopia reported that up to 2.7 million people in Ethiopia are acutely food insecure and require food or cash transfers in order to meet their basic food needs (USAID, 2014).

The case of Amhara National Regional State is similar to the country, Ethiopia. In 2012, there were 288,544 food insecure people in Amhara region who deserves emergency food assistance (DRMFSS, 2012). Similarly, there were 40,849 chronically food insecure people in Libo Kemkem district (Libo kemkem District Agriculture and Rural Development Office, 2013).

Different scholars tried to identify the food insecurity situation and it's determinates from various parts of the country. Amsalu *et al* (2012); Ayaleneh and Shimelis (2009); Girma (2012); Misgina (2014) had got 36, 76.65, 58.16 and 68.8 percent of food insecurity level respectively. In addition, cultivated land, family size, annual income, access to irrigation, age of household, credit, asset possession, access to employment, livestock ownership and use of fertilizer were identified as the major determinates of food insecurity. However, there are no sufficient studies done in Libo Kemkem district.

Hence, there is a need to carry out a study to come up with the level and determinants of household food insecurity situation. The finding of the study will provide relevant information for future planning and interventions of appropriate strategies to promote and maintain appropriate food security building activities.

1.1Objectives of the Study

The objectives of the study were to measure the food insecurity and to identify the major determinates towards the food insecurity situation of households in Libo Kemkem District, Amhara National Regional State, Ethiopia.

1.2 Working Hypothesis

In this study it was hypothesized that there is a relationship between food insecurity situation and some specific explanatory variables. Twelve explanatory variables were expected to affect the food insecurity situation of the households.

2. Methodology

2.1 Description of the Study Area

Libo Kemkem district is found in South Gonder Zone of Amhara National Regional State, Ethiopia. The climatic division of the district shows Woyena-Dega 81%, Dega 18.1% and Kolla 0.9%. The average higher temperature is 27.9^{0}C and lower 11.1^{0}C. The annual rainfall reaches from 900 mm- 1200 mm. Even if the distribution of rainfall is not normally distributed, the annual rainfall is high (CSA, 2008). According to Libo Kekem District Agriculture and Rural Development Office (2013) the population of the district is around 225,499 out of which 114,911 are males and 110,588 are females. crop production is the major agricultural activity that constitutes the lion share of income proportion that most households in the district earn. The district has a good potential in livestock husbandry. The performance and nature of agriculture in the district is backward and traditional type exhibiting low productivity.

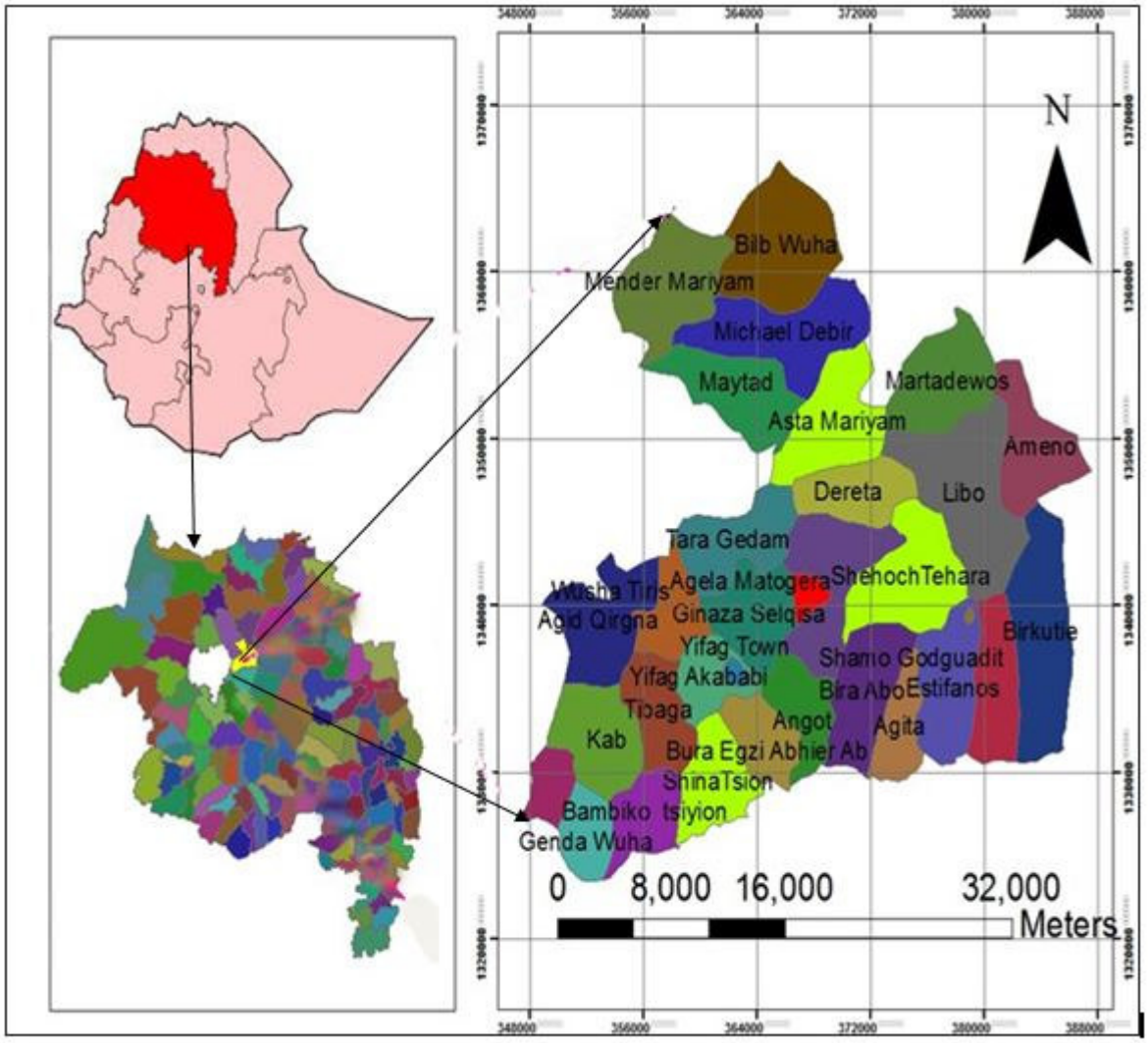

Figure 1. Map of Ethiopia, Amhara region, and Libo Kemkem district
Source: Central Statistical Agency, 2008

2.2 Research Design

In order to undertake this study, both primary and secondary data was used. Those which left from primary data were complimented by secondary data. A survey designed from the quantitative approach was employed. In addition, secondary data was obtained from various publications and organization reports to complement the study.

2.3 Sampling Technique

Multi stage random sampling was employed to undertake this study. From the total 34 kebeles in the district, three of them were selected as a representative of the whole district. Then the study participant households were selected proportionally from each kebele. A total of 213 sample households were interviewed.

2.4 Methods of Data Collection

Questionnaire was used as a source of data. Data collectors had used pen-toss random sampling technique to select the households to be interviewed. Pen toss is a random sampling technique and helps to decide the direction in which the data collection have to begin and households to be interviewed. Data was collected from household head (main income generator) or adult member of the family. The survey takes 6 days from March 1 up to March 6, 2014.

2.5 Methods of Data Analysis

Descriptive statistical analysis and binary logistic regression were used to analyze the data of study. The analysis was conducted by SPSS version 16.

The information to categorize households into two groups can be obtained by comparing the total household expenditure per AE per annum to the minimum level of expenses required to ensure survival per AE per annum. This minimum level of expense required per AE was computed based on the amount of calorie requirement by AE (2,100 kcal/AE/day or 225 kg/AE/year) (FDRE,2001; Fekadu and Mequanent, 2010). Consequently, 2,700 *Birr* was set as a threshold level by computing the value of this amount of cereal by the existing local market price of grain. Thus, those households beyond this threshold level classified as food secured otherwise not food secured.

Then twelve explanatory variables that were supposed to determine the food insecurity situation were identified. Eight of these variables were continues while the remaining four were dummy.

Since the dependent variable, food insecurity was a dummy variable, binary logistics model was used to identify the determinants of food insecurity and to assess their relative importance in determining the probability of being food insecure. Logistic regression model shows that changing an independent variable alters the probability that a given individual becomes food insecure, and will help to predict the probability of food insecurity. In the model, food insecurity was represented by 0 and food security with 1.

The formal equation of binary logistic regression model is

$$\mathbf{Zi=\beta_0+\beta_1X_1+\beta_2X_2+\ldots.+\beta_nX_n}$$

β_0 = is an intercept

$\beta_1, \beta_2 \ldots \beta_n$ = are slopes of the equation in the model

X_1 X2… X_n =are explanatory/ independent variables

If the disturbance term (Ui) is introduced, the model becomes

$$\mathbf{Zi=\beta_0+\beta_1X_1+\beta_2X_2+\ldots.+\beta_nX_n+U_i}$$

3. Results and Discussion

3.1 Food security situation of the households

The minimum level of expenditure required per AE was computed based on the amount of food required by an adult person (a calorie requirement of 2,100 kcal per day or 225 kg of cereal per AE per year) (FDRE, 2001; Fekadu and Mequanent, 2010). The local market price for 1kg of cereal was 12 *Birr*. Based on this, the minimum food expenditure per AE per year became 2,700 *Birr*. Those households whose annual food expenditure was less than this minimum threshold level were categorized as food insecure. In contrast, households who could meet the minimum threshold were categorized as food secure.

The result of the survey revealed that 108 households covering 50.7 percent of the sample were food insecure expending less than 2,700 *Birr* per AE per year for food. In contrast, 105 households covering the 49.3 percent were food secure. The mean expenditure of the households was found 3,427.35 *Birr* per AE per year.

3.2 Determinants of food insecurity

Before fitting the model, the problem of multicollinearity among explanatory variables was checked by using variance inflation factor (VIF) and contingency coefficient. The variance inflation factor (VIF) for continuous variables and contingency coefficient test for discreet variables provides evidence that there is no strong multicollinearity problem among explanatory variables. The VIF for each continuous explanatory variable was below 10 and the contingency coefficient for degree of association between dummy variables was below 0.75 indicating no strong relationship between explanatory variables. Thus, there was no need to drop explanatory variables from the estimation model.

The fitness of the model was checked by different parameters. Chi square was computed to check the significance of the model. Its value was found 75.753, which was significant at less than one percent probability

level. This showed that at least one or more of the independent variables are likely to have significant relationship with the dependent variable. This result supports the working hypothesis; food insecurity situation of the household is determined by explanatory variables.

The model revealed five variables that significantly determined household food insecurity. Odds ratio (Exp (B)) shows the change in odds resulting from a unit change in the predictor variable. The findings of the model are presented in Table 2 below.

Out of the 12 explanatory variables hypothesized to determine the food insecurity situation of the households, 5 variables were found with significant impact on determining the food insecurity situation. Soil fertility problem and participation in PSNP were found significant at less than 1 percent probability level. In addition, age of the household head was found significant at 5 percent probability level while total assets and income of the household were significant at less than 10 percent probability level. The effect of these variables on the food insecurity status of Libo Kemkem district households discussed as follows.

Income: this variable was found significant at less than 10 percent probability level. In agreement with the existing reality, its coefficient showed positive effect on food security. The possible justification could be the ability of income to be used as a source of purchased food. Also, income creates favorable room to diversify the livelihood strategies and to practice modern agricultural technologies. With one *Birr* increase in income of the household, the odds ratio in favor of food security increased by 1.000. The study conducted by Misgina (2014) also comes up with the same result.

Age of the household head: this variable was found significant at 5 percent probability level and the direction of coefficient of this variable showed a negative relation with food security situation of the household. The odds ratio result shows that with other things kept constant, an increase of one year in the age of the household head could result in decrease in the food security by a factor of 0.965. This is possibly due to having many household members in household. Households lead by older heads could have a high number of children and elders which are less productive. This leads to dependency and food insecurity in turn. This result was in harmony with the finding of Ayaleneh and Shimelis, (2009). However, the finding of the Benjamin and Joseph (2012), Fekadu and Mequanent (2010) and Yilma (2005) showed the positive impact of household age on food security.

Soil fertility problem: The odds ratio for this variable shows that households with soil fertility problem have a chance to be classified as food insecure with a factor of 0.339. This could be due to the dependence of crop production by the quality of the soil. The finding of this study with this variable is in harmony with Yilma (2005). However, Misgina (2014) and Mulugeta (2002) had come up with the insignificant effect of soil fertility problem on food insecurity.

Participation in PSNP: PSNP is one of the four food security programs practiced by the Ethiopian government. Participation in the program was found significant with negative coefficient. The possible reason for this is the targeting of the poor for the program. It also implies that PSNP did not build the resilience of the households to food insecurity problem and relive them from food insecurity. The odds ratio shows that households participating in this program have a chance to be food insecure with a factor of 0.266.

Total assets: this variable represented the value of total assets owned by the household in terms of *Birr*. The food insecurity situation is largely determined by possession of assets in the study area. These assets could be used to create an income source and sold as a coping mechanism. This variable was found positively and significantly associated with food security at 10 percent probability level. With constant condition of other variables, the odd ratio in favor of being food secure increases by a factor of 1.000 as the total assets increased by one unit (Birr). The study conducted by Benjamin and Joseph (2012) and Girma (2012) have also revealed the significant contribution of assets for food security.

4. Conclusion and Recommendation

Since half of the households found food insecure, food security building interventions are needed in the district. The interventions should focus on statistically significant variables of the model. Elder household heads should gain adequate consideration in the interventions. Asset building should be the focus of food insecurity building interventions. Income was found with positive impact on the household food insecurity. Thus, income generating activities should be created and strengthen. Also soil fertility has to be improved. In addition, PSNP have to work more to relive the households from food insecurity.

Note

1. *Birr* is the currency of Ethiopia.
2. Productive Safety Net program (PSNP) is one of the food security building interventions practiced by Ethiopian government.

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Table 1. Description of independent variables of the study

Independent variables of the study	Type of variable	Measurement unit
X1= Sex of the household head	Dummy	0,if the household head is female;1,if male
X2=Income of the household	Continues	Income gained by the household in *Birr*
X3=Access to credit	Dummy	Access to credit= 1, No access=0
X4=Age of household head	Continues	Completed years of the household head
X5=Average educational level of household	Continues	Average completed years of schooling by the household members
X6= Dependency ratio	Continues	<15yrs+ >64yrs / 15yrs-64yrs
X7= Size of cultivated land	Continues	Cultivated land holding of the household in hectare
X8= Livestock holding	Continues	Livestock holding of the household in TLU
X9= Soil fertility problem	Dummy	0, the presence of the problem; 1,the absence of the problem
X10= Livelihood strategies	Continues	The number of livelihood strategies practiced by the household
X11=Participation in PSNP	Dummy	0, the absence of the participation; 1, if the household participate in the program
X12=Total assets	Continues	The estimated value of total assets of the household in terms of *Birr*

Source: Own development, 2014

Table 2. Binary logistic regression estimates of food insecurity determinants (N=213)

Variables	B	S.E.	Wald	Sig.	Exp(B)
Sex of household head	.800	.529	2.289	.130	2.226
Income of the household	.000	.000	2.984*	.084	1.000
Access to credit	.320	.213	2.270	.132	1.378
Age of the household head	-.035	.015	5.894**	.015	.965
Average educational level	-.083	.089	.869	.351	.921
Dependency ratio	-.003	.003	1.058	.304	.997
Agricultural land ownership	.036	.105	.119	.730	1.037
Livestock holding	.000	.004	.006	.940	1.000
Soil fertility problem	-1.083	.389	7.751***	.005	.339
Livelihood strategies	.059	.296	.040	.841	1.061
Participation in PSNP	-1.324	.497	7.089***	.008	.266
Total assets	.000	.000	3.316*	.069	1.000
Constant	2.968	1.304	5.178	.023	19.449
Log likelihood	-109.486				
Chi square(X^2)	75.753***				
Prediction success	77.5 %				
R^2	0.299 (Cox and Snell), 0.399 (Nagelkerke)				

***, ** and * significant at 1%, 5% and 10% probability level, respectively.
Source: model output, 2014

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