

# Determinants of Rural Household Food Insecurity : The Case of Menz-Gera District of Amhara Regional State, Ethiopia

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## Abstract

The paper examined the extent of and factors associated with households' food insecurity in Menz Gera District using 150 randomly selected sample households. Household Calorie Acquisition (HCA), the amount of calories consumed via the household during the last seven days, has been used to measure the extent of household food insecurity. And 2200Kcal/day per adult equivalent was used as a food security line. The incidence, gap, and severity of the households' food insecurity were computed using the FGT food insecurity indices, and results in 84.7, 41.7, and 25.4 percent, respectively. Factors associated with the extent of the households' food insecurity were estimated using the Tobit regression model. Sex of the household head, family size, farm size, irrigation access, non/off-farm income participation, number of oxen, livestock holding, extension contact, and distance from main market center were statistically significant determinants. Therefore, the study recommended that special emphasis should be given in the area through the identified factors to eradicate the widespread food insecurity situation.

**Keywords:** Menz Gera, food insecurity, HCA, FGT, Tobit

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## Introduction

Realizing food security for all people at all times keeps on becoming a development challenge throughout the world especially for many developing countries like Ethiopia. The FAO 2014 report shows that around 795 million people in the world are estimated to be chronically undernourished and need enough food to lead a functioning and healthy life. The large extents of these food-insecure people were in developing nations particularly in Sub-Saharan Africa, where more than one out of four individuals stay undernourished (FAO, et al., 2014). Similarly, in Ethiopia, around 44 percent of the kids less than 5 years old are seriously and constantly malnourished or stunted, and almost 28 percent are under-weight. And about 32 percent of the country's population is undernourished, showing food insecurity as an inexorable issue in the country (USAID, 2015).

Food security assumed to exist "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). And, a person is food insecure "when they lack regular access to enough safe and nutritious food for normal growth and development and an active and healthy life" (Alain, 2013). The determinants of food insecurity are multidimensional (this is due to unavailability of food, lack of access or resources, improper utilization and instability over a certain period time) and complex. It may also occur at multiple levels (it can be global, regional, national, community, household, and individual levels), and include poverty, social and economic disadvantage, individual characteristics and the political and social environments. This means that achieving food security at a global or national or regional level does not necessarily indicate food security among communities, households, and individuals. Food insecurity can affect all stages of the lifespan resulting in poor dietary intakes and negative health consequences (Weinreb, et al., 2002; Alain, 2013; FAO, 2015).

In Ethiopia, several pieces of research have been conducted on the state of food insecurity in different times and areas (Fekadu & Mequanent, 2010; Mequanent, et al., 2014; Welderufael, 2014 ; Tsegaye & Wagayehu, 2010; Asenso-Okyere, et al., 2013). The researchers obtained different extent and determinants of food insecurity. The determinants including educational status of the household, income sources, family size, marital status, traditional farming practice, unstable weather conditions, recurrent drought, pests and disease, weak institutional capacity, inadequate infrastructure and social services. However, studies indicated that due to socio-economic, cultural, and physical environment heterogeneity throughout the country, consumption levels and pattern, the extent and determinants of food insecurity, and coping mechanisms adopting in time of food shortage are different spatially and in time.

Menz-Gera district, the current study area, is one of the most chronic food insecure rural districts of North Shoa Zone of Amhara regional state of Ethiopia. The district is dominantly *Dega* agro-ecologically and its agricultural practice has been highly challenged by recurrent drought, frost, erratic, late-onset and early offset rainfall distribution, pest existences, etc. events which lead to frequent crop failure and animal death and/or quality loss. Because of this challenge, the majority of the households in the district could not fulfill the food gap and create an additional asset in their family. Moreover, in Menz Gera district there is no similar study conducted and documented. Hence, the objectives of this study were measuring the extent and identifying factors determining

household food in Menz Gera district of Amhara regional state, Ethiopia.

## METHODOLOGY OF THE STUDY

### Data Type, Sources, and Collection Methods

Both primary and secondary data were collected from different sources to meet the specific objectives of the study. The secondary data have been collected from various published and unpublished sources including official government reports and research papers. The primary data on food consumption survey, coping mechanisms, and the farm households characteristics were obtained using semi-structured questionnaires containing closed and open-ended questions; face - to - face interviews with the farm households. The food consumption survey was carried out during optimum season, to avoid biases arising from the period of shortage and plenty. Similarly, a seven-day recall method, the kind and quantities of food items consumed during the last seven consecutive days, was used to abate errors that would be occurring due to some unforeseen factors such as holidays, religions (fasting), etc. Enumerators, who are familiar with the study area, who can understand the local language, and who have prior experience were recruited and trained regarding the objectives of the study, the content of the questionnaire, and the data collection procedure.

### Sample Size and Sampling Techniques

To select the sample respondents, a two-stage stratified random sampling procedure was used. In the first stage, *kebeles* were stratified into two homogenous strata of agro-ecological zones as midland and highland having 4 and 16 *kebeles*, respectively. Then, five sample *kebeles* were selected proportion to their size and randomly (1 from midland and 4 from highland) . In the second stage, after having the total number of households in each *kebeles*, 150 households were randomly selected, 30 from midland and 120 from highland, based on probability proportional to their size. A list of households, acquired from the *kebele* administration was used as a sampling frame to select households in each *kebele*. Finally, systematic random sampling has been used to select the household to be a respondent.

### Methods of Data Analysis

In this study, descriptive statistics, Foster-Greer-Thorbeck (FGT) decomposable poverty(food insecurity) measure and econometric methods of data analysis were used in analyzing the objective of the research. Descriptive statistics such as mean, standard deviation, frequency and percentage have been used to describe the socio-economic characteristics of the respondents.

The extent of food insecurity was measured using household calorie acquisition(HCA). In the Ethiopian context, food security is defined as access or entitlement to balanced basket food of 2,200 kcal per day or the cash equivalent of that (FEDRE, 2002; Eneyew, 2010). Therefore, 2,200 kcal per day per adult equivalent was used as a threshold to discern the food insecure from food secure. The calorie content is estimated using a nutrient composition table of commonly eaten foods in the study area. After that, per capita, calorie intake is calculated by dividing the estimated total household calorie intake by the family size after adjusting for adult calorie intake equivalent. Finally, the daily per capita calorie intake is then estimated by dividing the total household per capita calorie intake by seven. Households with a daily per capita calorie intake of 2,200 kcal and above are regarded as food secure, while those with lesser amounts are food insecure.

To measure the incidence, gap, and severity of food insecurity, a well-known modified version of the Foster-Greer-Thorbeck (FGT) poverty indices has been used. Following the (Foster, et al., 1984), the FGT indices can be specified as;

$$FGT(\alpha) = \frac{1}{N} \sum_{i=1}^H \left( \frac{Z - \eta^i}{z} \right)^\alpha ; \quad \alpha \geq 0, \text{ for } \eta^i < Z \quad (1)$$

Where; Z is food security line (2,200 kcal per adult per day),  $\eta^i$  is daily calorie intake per AE of  $i^{\text{th}}$  household, N is total sample size, H is the number of households below the food security line. The parameter  $\alpha$  is the aversion parameter that takes values of zero, one and two (weighted attached to food insecurity). If  $\alpha$  equal to zero, FGT (0) is the headcount index measuring the incidence of food insecurity, the proportion of households living below the food security line out of the total sample households. Setting  $\alpha$  equal to one, FGT (1) is the food insecurity gap ratio, measuring the intensity/depth of food insecurity. That is, on the average, how far the food insecure is from the food security line. If  $\alpha$  equal to two, then FGT (2) is the severity of food insecurity among households, the squared proportional shortfalls from the food security line.

Moreover, to estimate the factors associated with the extent of food insecurity, Tobit regression model was used. Here, the researcher is interested in estimating both the extent and the probability that a household is food insecure, given the explanatory variables. That is the logic to use the Tobit regression model, it has a superior quality than logit and probit, it can do both of the researcher's interest as the same time. Following (Greene, 2012)

the tobit regression model is expressed as follows:

$$y_i^* = x_i\beta + \varepsilon_i$$

Where  $y_i^*$  is a latent variable that is unobserved for values less than 2200, which is in this study the extent of food insecurity measured in HCA,  $X_i$  is a vector of exogenous variables such as age, sex, marital status, education level of the household head, family size, dependency ratio, access to irrigation, participation non/off-farm activities, distance from main road and market, agro-ecology, insect and pest infection.  $\beta$  is the vector of the unknown parameters  $\varepsilon_i$  is a zero-mean, independently and identically distributed normal random disturbance term.

## RESULTS AND DISCUSSIONS

### Socio- Economic characteristics

Out of the total 150 respondents 69.67 percents ,44 percents, and 57 percents were male headed, illiterate and married, respectively. The average age and family size of the household heads were 48.32 and 4.03 with a standard deviation of 13.92 and 1.51, respectively. On average about 90 percent with a standard deviation of 79.7 percent members in a household were dependent. The Agro-ecological zone distribution of the respondents was 20 % from the midlands (Woyna Dega) elevation of 1500–2400 meter above sea level(masl), and about 60% from highland(Dega) elevation of greater than 2400 masl. Access to irrigation, credit, market, road, extension services play a vital role in reducing food insecurity by increasing access and utilization to food. In Menz gera district, only 25.33 percent and 32 percent of

**Table 1: Socio-economic characteristics of the respondents**

Variable	Categories (measurments )	Mean ± St.Dev	Frequencies	Percent
Age of hh	Years	48.32±13.92		
Sex of the hh	Female		59	39.33
	Male		91	69.67
Family size	Adult equivalent	4.03±1.51		
Marital status hh	Married		86	57.33
	Otherwise		64	42.67
Education status hh	literate		44	66
	Illiterate		56	84
Total dependence ratio	Percentage	89.77±79.7		
Children dependency ratio	Percentage	78.67±77.7		
Aged dependency ratio	Percentage	11.1±22.1		
Farm size	Percentage	0.929±0.474		
Number of oxen	Hectare	0.766±0.718		
Livestock	Thu	2.576±2.87		
Nearest market center	Minute	135.83±80		
Extension contact	Count	9±5.32		
Expenditure on farm inputs	Birr	1707±1406		
Irrigation	User		38	25.33
	Non-user		112	74.67
Access to credit	User		48	32
	Non- user		102	68
Amount of credit (birr)		1262.1±2267		
Agro-ecology zone	Mid-land		30	20
	High-land		120	80
Non\Off-Farm	Participant		60	40
	Non- participant		90	60
Incidence of Pest and insect	Affected		82	54.67
	Not- affected		68	45.33

the respondents had an irrigation and a credit access, respectively. About 60 percent of them do not have the experience participating in non and/or off-farm income activities. The average distance from the respondents

homestead to main market is about 135 minutes, they have to walk on foot on average for about 2 hours and 35 minutes.

### The Extent of Food Insecurity

The results of household calorie intake per day per AE, incidence, gap, and severity of food insecurity are presented in Table 1. The mean daily calorie intake per day per AE was 1389.25 kcal with extreme ranges of the lowest 84.19 and the highest 4228.05 kcal, which is below the national average of 2928 kcal (Woldehanna, 2014) and daily requirement of 2200 kcal per day per adult equivalent for an active and healthy life. Out of the total sample households 84.7 percent, more than 8 out of 10 households, could not get the daily recommended caloric requirement. Similarly, the gap of food insecurity also implies that each food-insecure household requires 41.7 percent (917.4 kcal) of the daily recommended calorie requirement to get out of the food insecurity trap.

Table 2: Summary of the extent of household food insecurity

Variable	Index	Std. Dev.	Min	Max
Daily Average Calorie intake in AE	1389.25	847.38	84.19	4228.05
Incidence of food insecurity [FGT(0)]	0.846		0	1
Food insecurity gap [FGT(1)]	0.417	0.283	0	0.961
Severity of food insecurity [FGT(2)]	0.253	0.234	0	0.924

Source: Own survey, 2015

### Determinants of Food Insecurity

To identify the determinants of rural household food insecurity Tobit regression model utilized.

Prior to fitting the model, it was imperative to check whether significant problems of multicollinearity, association among explanatory variables, heteroscedasticity and specification bias. For this reason, different tests were made and treated accordingly. And the choice of the variables, mentioned in table below, was based on the economic, statistical and econometric criteria.

Sex of the household head was found to be significant and positive at one percent level of significance. The positive sign indicates that, keeping other things constant, the male headed household heads average calorie intake was higher than female headed households by 186.35 kcal. In other words, female headed households were more food insecure than that of their counterpart male headed households. In the area where this study conducted, cultural taboos limit female headed households from participating in different income generating activities, and are not in a better position to manage their farm land as well as to utilize their family labor properly consequently they are obliged to renting out their farm land. In short, their poverty and low social status in the society in the past periods may be a major contributor to severe food insecurity status. This finding coincides with study done by (Guja, 2012).

Family size was the other factor hypothesized to have considerable effect on food insecurity. The result of this study confirmed the hypothesis at 1 percent significance level. As family size increase by one adult equivalent, the calorie intake per AE decreased by 159.68, holding other things constant. This is plausible that increasing family size to a small and low productive resource holder farmers means increasing demand for food, or reduce per-capita food consumption and leads to food insecurity. The result coincides with (Guja, 2012; Goshu, et al., 2013); Degye *et al.* 2013).

Table 4: Tobit estimation of HCA of the food insecure households

HCA	Coefficients	Standard errors
Age of the hh	0.221	13.09
Sex of the hh (1=Male)	511.2***	132.3
Family size(AE)	-999.3***	230.2
Education status(1=Literate)	310.9	316.8
Dependency ratio	-1.238	1.921
Farm size(hectare)	626.0**	292.6
Irrigation(1=user)	293.5*	191.3
Extension contact(count)	42.57	39.55
Number of oxen(count)	436.6*	241.4
Livestock(tlu)	127.71**	48.72
Access to non/off-farm activities (1=participate)	787.4**	329.5
Distance from the nearest main market	-4.478**	2.014
Incidence of Pest and insect(happened)	-479.1	363.8
Constant	225.6	882.3
Sigma	852.5***	138.4
Observation		150
Left censored observation		0
Uncensored observation		127
Right censored observation at HCA $\geq$ 2200		23
LR chi2(11)		167.64***
Log likelihood		-957.93

**Note:** Single, double, and triple asterisks (\*, \*\* and \*\*\*) indicate significance at the 10%, 5% and 1% level, respectively.

Source: Own field survey data, 2015

Family size was the other factor hypothesized to have considerable effect on food insecurity. The result of this study confirmed the hypothesis at 1 percent significance level. As family size increase by one adult equivalent, the calorie intake per AE decreased by 159.68, holding other things constant. This is plausible that increasing family size to a small and low productive resource holder farmers means increasing demand for food, or reduce per-capita food consumption and leads to food insecurity. The result coincides with the study of (Goshu, et al., 2013).

The coefficient of farm size is positive and statistically significant at 5 percent significance level. This indicates that, other things remain constant, when farm size increase by one hectare, the daily calorie intake per AE of the food insecure would increase on average by 159.86 kcal implying that as farm size increase for smallholder more crops can be grown and enough food can be produced at least for consumption, and thus reduce of food insecurity. This study is in line with the studies of (Asmelash, 2014) that large farm size negatively affects at 5 percent significance level food insecurity.

Livestock in general and draught oxen have great economic and personal values for farmers. They are a source income, quality food, fuel and fertilizer and draught power. In this study, livestock holding was hypothesized to have a positive influence on calorie intake and negative on food insecurity and confirmed at 5 percent significance level meaning increasing more livestock holding is associated with high relatively high daily calorie intake. This finding is inline with the findings of (Muche & Mequanent, 2010; Bazezew, 2012). The coefficient of oxen was also found to be significant and positive at 10 percent level of significance. The result indicates that households with enough oxen power are less food insecure than those who do not have. The reason is that those who do not have enough oxen cannot manage their farm land timely and properly, as a result decrease farm production and productivity. The study concedes with studies done by (Fekadu and Mequanent, 2010).

Non and /or off-farm income contributes to higher food production and farm income by easing capital constraints as well as use as a coping strategy to overcome their food insecurity situation, thus improving household welfare in multiple ways or supplements farm income during food deficit. The coefficient of this variable is found to be negative and statistically significant at 5 percent significance level. Keeping other factors constant, households who had not non and/or off farm income source calorie intake per AE were lower by 322.99 kcal compared to those who had none and/or off farm income source. This study confirms the studies of (Bazezew, 2012; Goshu, et al., 2013) that participating in off-farm activities significantly contributes in reducing food insecurity at 5 percent significance level.

**Incidence of Insect and pest:** Insect and pests affect food crops causing significant losses to farmers and reduces food availability, thereby aggravate food insecurity. The study result revealed that households affected by insect and pest being more food insecure compared to those households not affected by insect and pest. This is in agreement with the expectation in this study and studies done by (Getahun & Fikadu, 2014) that insect and pest problem affects positively and significantly food insecurity less than one percent significance level.

### Conclusions

The study result revealed that the extent of food insecurity in Menz Gera district very high. About 85 percent of the district households were not able to meet the daily recommended 2200 kcal per day per adult equivalent for health. The food insecure households were far away from the threshold or food security line of 2200 by 41.7 percent (917.4 kcal). The mean calorie consumption of the respondent was 1389 kcal per day per adult equivalent. This is too far below the national average and minimum average calorie intake per day per adult equivalent of 2200 kcal for active and health life. Similarly, the sample respondents experienced food shortage on average for about 6.3 months per year. All these results indicate most of the farm households having insufficient access to enough, safe, nutritious and socially acceptable level of food for a healthy and normal life.

From the Tobit model result 10 statistically significant explanatory variables have been identified to determine the magnitude of food insecurity less than 10 percent significance level. These are: Sex of the head, education status of the head, oxen, TLU, farm size, irrigation, non and /off-farm, distance from nearest market center, and incidence of pest and insect. Being female headed, large family size, illiteracy, lack of irrigation access, poor participation in non/off-farm activities, pest and insect incidence and distant market center were aggravated the prevalence of food insecurity. On the other hand, enough oxen power, large livestock ownership and sufficient farm size were possibly reduced it. Therefore, strong effort is needed from all development actors so as to reverse the widespread food insecurity situation in the area through the identified factors.

### References

- Alain, G. P. S., 2013. Migration and food insecurity: social and nutritional issues for recent immigrants in Montreal, Canada. *International Journal of Migration, Health and Social Care*, pp. 32-45.
- Asenso-Okyere, K., Daniel, A. M. & Elias, Z., 2013. Determinants of food security in selected agro-pastoral communities of Somali and Oromia Regions, Ethiopia.. *Journal of Food Science and Engineering* , 3(9).
- Asmelash, M., 2014. Rural household food security status and its determinants: The case of Tigray regional state, Ethiopia. *Journal of Agriculture Extension and Rural Development*, 6(5), pp. 162-167.
- Bazezew, A., 2012. Determining food security indicators at household level in drought prone areas of the Amhara region of Ethiopia: The Case of Lay Gaint district Ethiopian. *Journal of Environmental Studies and Management*, 5(4).
- Eneyew, A., 2010. Review of Literature on Ethiopian Food Security Strategy and its Linkage to Other Policies. *Preserve Articles*.
- FAO, 1996. *Rome Declaration on World Food Security and World Food Summit Plan of Action.*, Rome.: World Food Summit.
- FAO, 2015. [www.fao.org](http://www.fao.org/hunger/en/). [Online] Available at: <http://www.fao.org/hunger/en/>
- FAO, IFAD & WFP, 2014. *The State of Food Insecurity in the World 2014*, Rome: FAO.
- FEDRE, 2002. *The Federal Democratic Republic of Ethiopia*, Addis Ababa , Ethiopia: s.n.
- Fekadu, B. & Mequanent, M., 2010. Determinants of Food Security among Rural Households of Central Ethiopia: An Empirical Analysis. *Quarterly Journal of International Agriculture*, pp. 299 - 318.
- Foster, J., Greer, J. & Thorbecke, E., 1984. A class of decomposable poverty measures. *Econometrica* , 52(3), pp. 761-766.
- Getahun, T. & Fikadu, B., 2014. Factors influencing rural households' food insecurity: the case of Babile District, East Harerge zone, Ethiopia.. *Journal of Development and Agricultural Economics.*, 6(4), pp. 149-158.
- Goshu, D., Kassa, B. & Ketema, M., 2013. Measuring diet quantity and quality dimensions of food security in rural Ethiopia. *Journal of Development and Agricultural Economics*, 5(5), pp. 174-185.
- Greene, W., 2012. *Econometrics Analysis*. 7th ed. Boston: Pearson Education.
- Guja, M. M., 2012. Household Food Security Status and Coping Strategies in Humbo Wereda. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, pp. 64-82.
- Mequanent, M., Endalew, B. & Koricho, T., 2014. Determinants of household food security among Southwest Ethiopia rural households.. *Food Science and Technology* , pp. 93-100.
- Muche, F. B. & Mequanent, M., 2010. Determinants of Food Security among Rural Households of Central Ethiopia: An Empirical Analysis. *Quarterly Journal of International Agriculture*, Volume 494: , pp. 299-318.
- Tsegaye, G. & Wagayehu, B., 2010. Farmers' perceptions of land degradation and determinants of food security at Bilate Watershed, Southern Ethiopia. *Ethiopian Journal of Applied Science and Technology*, 1(1), pp. 49-62.

- USAID, 2015. *USA assistance fact sheet-ethiopia.*, s.l.: USAID.
- Weinreb, L. et al., 2002. Hunger: its impact on children's health and mental health. *Pediatrics*, pp. 1-9.
- Welderufael, M., 2014 . Determinants of households vulnerability to food insecurity in Ethiopia: econometric analysis of rural and urban households. *Journal of Economics and Sustainable Development*, 5(24), pp. 70-79.
- Woldehanna, T., 2014. *The Policy Environment for Linking Agricultural and Nutrition in Ethiopia. Working paper.* Addis Ababa , s.n.