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# Magnitude and associated factors of household food insecurity in Fedis Woreda East Hararghe zone, Oromia region, Ethiopia

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## Abstract

**Background:** Poverty and food insecurity remain as the major challenges to achieve economic development in Ethiopia. Explaining the household food insecurity situation and identifying associated factors will help in making better decision and resource allocation. This study aimed to determine the magnitude and identify the associated factors of household food insecurity in Fedis Woreda that has been affected by food insecurity for the quite time with a total population estimated to be 133,382 persons, of which the estimated urban population is 26,575 and estimated rural population is 127,877. The Woreda is in food deficit every year where the food gap is covered by food aid amounting to 15–25% for the poorest households of Ethiopia. Cross-sectional study was used to collect data on calorie availability at household level, demographic characteristics, socioeconomic factors and coping strategies from 743 households. Household food insecurity was obtained by comparing the total food calorie available for consumption in the household per adult equivalent to the minimum level of subsistence requirement per adult equivalent of 2200 kcal. Data were analyzed using Statistical Product and Service Solution. Binary logistic regression analysis is used to determine the association between dependent and independent variables.

**Results:** About 58% of the sampled households in the study area were food insecure. The binary logistics regression analysis identified educational status of the household head [AOR, 95% CI 0.59 (0.38–0.91)], annual farm income [AOR, 95% CI 0.44 (0.287–0.675)], sufficient crop production [AOR, 95% CI 0.45 (0.274–0.748)], dietary diversity [AOR, 95% CI 0.548 (0.382–0.786)] and oxen ownership [AOR, 95% CI 0.454 (0.323–0.639)] were the major factors inversely associated with food insecurity status. On the other hand, large family size [AOR, 95% CI 6.143 (2.40–15.0)], lower than average monthly off-farm income [AOR, 95% CI 1.85 (1.18–2.91)] and small land size [AOR, 95% CI 3.04 (2.04–4.52)] were increased the chance being food insecure household in the study area.

**Conclusions:** The findings imply that more than half of the community was food insecure where improvement in food security situation needs to promote family planning, undertake different income generating activities and improve access to farmer's education. These areas could provide entry points for policy intervention to reduce food insecurity and create community livelihood opportunities.

**Keywords:** Food insecurity, Cross section, Household, Ethiopia

## Background

Food security, as a concept emerged at the United Nations Food and Agriculture Organization, the World Food conference in 1974 by considering food availability as the central argument [1, 2]. The World Food Summit

in 1996 defined food security as a situation “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” [2].

Food security is a prerequisite for healthy eating and foundational to human and environmental health. It is a basis for the prevention of chronic disease and

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promotion of healthy growth and development. It is integral to healthy living and environmental health protection [3]. Sub-Saharan Africa is one of the most food insecure regions in the globe [4]. The failure of Sub-Saharan African countries to feed their population has been attributed to climate shocks, mainly drought and the subsequent water scarcity, resource degradation, bad governance and inefficient policies, widespread epidemic, technological stagnation and conflict [5].

Poverty and food insecurity remain as the major challenges to achieve economic development in Ethiopia, and especially in the rural area of the country. This is due to the subsistence nature of Ethiopian agriculture, its mere dependence on rainfall and the existing backward technologies, which have made farmers highly vulnerable to famine and food insecurity. Many Ethiopians live in conditions of chronic hunger with both daily energy supply 1880 kcal/capita/day and 44% prevalence of under-nourishment [6]. Hence, the issue of food insecurity and efforts to achieve food security will remain the primary concern of governments and households mainly, those people in lower income or vulnerable groups in the country [7]. The study conducted in 2012 in Shashemene District found in southern Ethiopia [8] indicated that food insecurity in Ethiopia derives directly from dependence on undiversified livelihoods based on low-input and low-output rain-fed agriculture. Ethiopian farmers do not produce enough food even in good rainfall years to meet consumption requirements. Food accessibility was also limited due to a weak subsistence agriculture-based economy, depletion of assets, absence of income diversity and a lack of alternative coping mechanisms.

The depth of food insecurity varies within and between households. The food insecurity status of a household and its members is very sensitive to livelihood stresses and thus changes over time. Empirical evidences have also shown that many factors are responsible for household food insecurity. For instance, a case study conducted in Dire Dawa in 2003 investigated family size, annual income, amount of credit received, irrigation use, age of household head, status of education, cultivated land size, livestock ownership and number of ox owned to be the most determinants of food insecurity [9]. In addition, a study conducted in Oromia [10] has shown family size, number of oxen owned, use of chemical fertilizer, size of cultivated land, farm credit use, total annual income per adult equivalent, food consumption expenditure, livestock owned and off-farm income per adult equivalent to be the major causes of food insecurity. Fedis Woreda or district is one of the severely food insecure Woredas (district) found in the East Hararghe zone in Oromia region as they live on marginal and moisture stressed, and heavily degraded and less productive land. Moreover,

increasing population, recurrent drought and resource degradation in the study area have made the food security situation worse. Realizing this issue, many governmental and non-governmental organizations are intervening at least to lessen the adverse effects of the food problem, but there is yet little success.

Therefore, this study determines the magnitude and identifies the determinant factors of food insecurity. Explaining the household food insecurity situation and identifying associated factors will help in bringing an improvement in making better decisions and resource allocation to improve the food insecurity status of the region. Moreover, it will support development practitioners and policy makers have better knowledge as to where and how to intervene in rural areas to bring food security or minimize the severity of food insecurity in the country and in the region in general and in Fedis Woreda in particular.

## Methods

### Study setting

The East Hararghe zone is located in the Oromia region. It is among the chronically food insecure areas of the country which faces recurrent drought situation. The livelihoods in the zone comprise of agro-pastoralists and pastoralists. There are 19 Woredas in the zone with 14 of them being agro-pastoralists. The rainfall is bimodal with the Kiremt rain being important in the crop-dependent areas. The amount of rainfall varies between 650 and 750 mm, while the average temperature of the Woreda diverges between 25 and 30 °C [11].

Fedis is one of the lowland Woredas that have been affected by food insecurity for the quite time with a total population estimated to be 133,382 persons, of which the estimated urban population is 26,575 and estimated rural population is 127,877. The Woreda is in food deficit every year where the food gap is covered by food aid amounting to 15–25% for the poorest households. The altitude of the Woreda ranges from 1050 to 2118 m above sea level [12]. It is a predominantly Woina Dega livelihood zone. The main sources of income are agriculture (particularly chat and livestock sales), self-employment (firewood sales) and local labor (harvesting and packing chat). Sorghum and maize are grown for home consumption; purchase is an important source of food. The area is considered to be a food deficit area—reflecting small land holdings and erratic rains. Currently, the government is carrying out of the Productive Safety Net Program to support chronically food insecure households.

### Source and study population

All households in Fedis Woreda of East Hararghe zone were source population, and all randomly

selected households from Fedis Woreda were the study population.

### Sample size and sampling procedures

To determine sample size for the study population, the following assumptions were made. The actual sample size for the study was determined using the formula  $n = (Z_{\alpha/2})^2 P(1 - P)/d^2$  assuming 5% marginal error and 95% confidence interval at alpha ( $\alpha = 0.05$ ). According to the study conducted on *Food insecurity and Coping strategy in Kersa Woreda*, the prevalence of food insecurity is found to be 70% [13]. As both Woredas have similar livelihood in terms of crop and livestock production system, the prevalence is assumed to be similar [13]. Therefore, using the formula  $N = (Z_{\alpha/2})^2 P(1 - P)/d^2 = (1.96)^2 0.7(1 - 0.7)/(0.05)^2 = 323$ . Since two-stage sampling technique was used, the sample size was multiplied by a design effect 2.  $N = 323 \times 2 = 646$ . By assuming non-response rate and incomplete questionnaire taking 15%, the total sample size was  $N = (646 \times 15\%) + 646 = 743$ .

A two-stage random sampling procedure was used to select 743 rural households. First, four kebeles (the smallest administrative unit) were randomly selected from 19 kebeles, and then, the sample size was distributed proportionate to the size of each kebele's population. Finally, the 743 households were selected from the corresponding kebeles using a systematic random sampling using sampling interval of every 7th household.

Inclusion criteria—all households that are represented by spouse by the time of interview. Exclusion criteria—households that are not represented by physically or mentally fit spouse by the time of interview will be excluded from the interview.

### Study variables

#### Dependent variable

In this study, food insecurity at household level was considered as a dependent variable (food secure/insecure).

#### Independent variables

Household head age, sex, marital status, educational status, family size, total farm land, livestock ownership, off-farm income, household income/farm income and modern farm input utilization were considered as independent variables.

#### Operational definition

Household food security was measured using household calorie availability. Household calorie availability was computed from each food item consumed and was grouped and adjusted for food processing to obtain the net weekly calorie availability using the Ethiopian Health Research Institute (EHNRI) Food Composition Table

[14]. The net weekly calorie availability was divided by seven to obtain the household daily calorie intake. The family size of each household was converted into an adult equivalent family size, which considers age and sex of each family member in the household. The daily net calorie consumption of the household was divided by the adult equivalent family size to obtain the daily calorie availability per adult equivalent of the household.

*Severe food insecure households* Households whose daily calorie intake per adult equivalent found to be less than 1500 were considered as severely food insecure.

*Moderate food insecure household* Households whose daily calorie intake per adult equivalent found to be between 1500 and 1800 were considered as moderate food insecure.

*Mild food insecure household* Households whose daily calorie intake per adult equivalent found to be between 1800 and 2200 were considered as mildly food insecure.

*Food secure households* Households whose daily calorie intake per adult equivalent found to be greater than 2200 were considered as food secure household.

*Inadequate dietary diversity* Households who had consumed  $\leq 3$  types of food groups (namely from cereals, vegetables and vitamin A-rich fruits).

*Medium dietary diversity* Households who had consumed 4–5 types of food groups (namely from cereals, vegetables, vitamin A-rich fruits and oil).

*Adequate dietary diversity* Households who had consumed  $\geq 6$  types of food groups (namely from cereals, vegetables, vitamin A-rich fruits, oil, fish, legumes, nuts and seeds).

### Data collection method

A structured survey questionnaire was designed in English and translated into Oromifa, the local language of the region. The questionnaire was tested prior to the data collection process near to the study population area which has similar livelihood and depending on the results of the pretest; it was revised in the lights of suggestions received. The household spouse was the main respondent. The questionnaire encompasses information on demographic characteristics, crop production, asset ownership, such as land use, oxen, access to different services like market, a health post and credit as well

as coping strategies employed by the households during food shortage.

**Data management and quality control**

To collect the data, twelve data collectors and one supervisor were recruited for ten working days, i.e., from April 8, 2014, to April 21, 2014. To assure the data quality, 1-day training was given to twelve data collectors and one supervisor on April 8, 2014. Each data collector conducted two pretests on 24 clients before the actual work started. Necessary information and instruction on the objective; relevance of the study was given to the respondents. Following data collection, the sample household responses were coded and analyzed using Statistical Product and Service Solution (SPSS) version 20. Descriptive statistics, such as mean, percentage and frequency, was used. In order to identify the determinants of food insecurity and assess their relative importance in determining the probability of being food secure or not, binary and multivariate logistic regression was used. In the regression analysis, bivariate binary logistic regression was done between each of the independent and dependent variables to select the most important variables for the multivariate analysis. To identify the independent effects of each predictor variable, variables with *P* value less than 0.2 were considered for the multivariate binary logistic regression analysis. The dependent variable was household food insecurity (HFIS) that is dichotomous taking a value of 1 if the household is food insecure, 0 otherwise.

The information, which identifies the food insecure from the food secure, was obtained by comparing the total food calorie available for consumption in the household per adult equivalent (AE) to the minimum level of subsistence requirement per AE 2200 kcal. A household below this threshold is said to be food insecure ( $Z_i = 1$ ), otherwise food secure ( $Z_i = 0$ ). Once the group are categorized as food secure and food insecure, the next step is to identify the socioeconomic factors that are correlated with the food insecurity. A variety of models can be used to establish the relationship between the potential determinant factors and food insecurity. The study employed the logit model in line with earlier researchers. Following Bogale study [15], the cumulative logistic probability model can be econometrically stated as:

$$P_i = F(Z_i) = \frac{1}{1 + e^{-(\alpha + \sum \beta_i X_i)}}$$

where  $P_i$  is the probability that an individual is being food insecure given  $X_i$ ,  $X_i$  is a vector of explanatory variables,  $\alpha$  and  $\beta$  are regression parameters to be estimated and  $e$  is the base of the natural logarithm.

For ease of interpretation of the coefficients, a logistic model could be written in terms of the odds and log of odd. The odds ratio is the ratio of the probability that a household would be food insecure ( $P_i$ ) to the probability of a household being food secure ( $1 - P_i$ ).

That is,  $\frac{P_i}{1 - P_i} = e^{Z_i}$

Taking the natural logarithm of the equation yields:

$$\ln \frac{P_i}{1 - P_i} = Z_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m$$

If the error term  $\epsilon_i$  is taken into account, the equation becomes:

$$Z_i = \alpha + \sum \beta^{i_m} X_i = 0 = 0 X_i + \epsilon_i$$

In this study, the explanatory variables used in the model included:

- X1 Age of household head (age group) 1 = 15–24, 2 = 25–34, 3 = 34–49 and 4 = 50–64
- X2 Education level of household head (1 = Can't read and write, 2 = Primary school, 3 = Secondary school)
- X3 Family size (1 = 1–3, 2 = 4–6, 3 = 7–10, 4 = > 10)
- X4 Land size (0 = < 0.5, 1 = 0.5–1, 2 = > 1)
- X5 Ox ownership (0 = No, 1 = Yes)
- X6 Sufficient crop production for the year (0 = No, 1 = Yes)
- X7 Annual farm income (1 = No income, 2 = 100–500, 3 = 501–1000, 4 = > 1000)
- X8 Average monthly off-farm income (1 = No income, 2 = 100–500, 3 = 501–1000, 4 = > 1000)
- X9 Health status, if they have been sick during the past 3 months (0 = No, 1 = Yes)
- X10 Food aid/remittance received (0 = No, 1 = Yes)
- X11 Modern agricultural input used (0 = Don't use, 1 = Used improved seed only, 2 = Used fertilizer only, 3 = Used both inputs)
- X12 Dietary diversity (1 = ≤ 3 food groups, 2 = 4 and 5 food groups, 3 = ≥ 6 food groups)

**Results**

Out of the seven hundred forty-three sample households, 730 (98.3%) were considered for the analysis. In the study, 697 (95.5%) of the households were male-headed and 33 (4.5%) female-headed households. The mean age of the study was 37 year ( $\pm 8.768$ ) where the minimum and maximum age was 20 and 60, respectively. Looking at the marital status, 98.8% are married. Result on the education level shows that 79.3% of households can't read

and write. The average family size for the overall sample household was 5.69 ( $\pm 1.559$ ), where the minimum and maximum size was 2 and 15, respectively (Table 1).

### Household food insecurity

Based on the food security cutoff point, i.e., 2200-kcal threshold point as a benchmark, 427 (58.5%) sample households were found to be food insecure. Of the total study participants, 128 (17.5%), 123 (16.8%) and 176 (24.1%) were severe, moderate and mild food insecure households, respectively. In order to combat the seasonal food shortage, households have used different coping mechanisms where borrowing money accounts highest (Table 2).

### Factors associated with household food insecurity

The association between each explanatory variable and household food insecurity status was done. Bivariate binary logistic regression analysis between each predictor variable and the household food insecurity status was performed to identify the significant candidate predictor variables that

would qualify for the multivariate analysis. Taking the  $P$  value of  $< 0.2$  as a cutoff, twelve independent variables were fitted to the model. Then, using a forward stepwise regression, eight variables were found to be significant ( $P < 0.05$ ). The eight factors that were retained were the educational status of the household head, family size, farmland size, household's annual farm income, household average monthly off-farm income, ownership of oxen, sufficient crop production over the year and dietary diversity (Table 3).

Households that have obtained better income from their own land are less likely to become food insecure than those households who had no or little income. Other things are held constant; the odds ratio in favor of the probability of being food insecure decreases by 56% as households earning increases by one Birr [AOR 0.440 (95% CI 0.287–0.675,  $P < 0.001$ )]. However, the presence of an off-farm income in the household has a negative influence on the status of household food insecurity, meaning that households who earn better income are 1.8 times more higher to be food insecure [AOR 1.849 (CI 1.175–2.911,  $P = 0.008$ )]. Those household who have eaten at least four or five types of food groups per day are 45.2% less likely to be food insecure compared with those who have eaten less food items [AOR 0.548 (CI 0.382–.786,  $P = 0.001$ )].

Categorization of household based on education exhibited that households that have attended at least primary school are 40.9% less likely to be food insecure compared with those who can't read and write [AOR 0.591 (CI 0.385–.908  $P = 0.016$ )].

Households who have a larger family size are six times higher to be food insecure than households with few family sizes [AOR 6.143 (CI 2.402–15.708,  $P < 0.001$ )].

Regarding the land size, households who had a land size between 0.5 and 1 ha are three times more higher to be food insecure than households that have less than half hectare [AOR 3.037 (CI 2.039–4.521,  $P < 0.001$ )]. Households who had sufficient production over the years are 54.7% less likely to be food insecure than those who had experienced shortage of crop production (AOR 0.452 (95% CI 0.274–0.748,  $P = 0.002$ )).

**Table 1 Sociodemographic characteristics of Fedis Woreda households, 2014**

Variable	Category	Frequency	Percent
Sex	Female	33	4.5
	Male	697	95.5
Age in years	15–24	29	4.0
	24–34	242	33.2
	35–49	376	51.5
	50–60	83	11.4
Education	Can't read and write	576	79.3
	Primary school	141	19.3
	Secondary school	10	1.4
Marital status	Married	699	98.8
	Divorced	3	0.4
	Widowed	28	3.8
Family size	1–3	28	3.8
	4–6	482	66
	7–10	218	29.3
	>10	2	0.3

**Table 2 Coping mechanism used by Fedis Woreda households for seasonal food shortage (multiple response is possible)**

Coping mechanism	Frequency of insecure HH 427 (58.5%)	Frequency of secure HH 303 (41.5)
Borrowed money/food from relatives/neighbors	187 (43.8)	96 (31.7)
Family members went to other places in search of jobs/migration	50 (11.7)	44 (14.5)
Sold asset	28 (6.6)	24 (7.9)
Worked for payment in kind/cash	15 (3.5)	17 (5.6)
Selling chat	181 (42.4)	101 (33.3)



**Table 3 Results from multivariable analysis-adjusted for demographic and socioeconomic factors of household food insecurity of Fedis Woreda, East Hararghe zone, Oromia region April 2014**

Explanatory variables	Food security status		AOR	95% CI		P value
	Insecured HH	Secured HH		Lower	Upper	
<i>Education level</i>						
Can't read and write	357	222	1			0.024
Primary school	67	74	0.591	0.385	0.908	0.016
Secondary school	3	7	0.299	0.061	1.471	0.137
<i>Family size</i>						
1–3	9	19	1			< 0.001
4–6	254	228	2.652	1.083	6.493	0.033
> 7	164	55	6.143	2.402	15.708	< 0.000
<i>Land size</i>						
< 0.5	67	111	1			< 0.001
0.5–1	344	178	3.037	2.039	4.521	< 0.001
> 1	16	14	1.748	0.710	4.305	0.225
<i>Oxen ownership</i>						
No	284	153	1			< 0.001
Yes	143	150	0.454	0.323	0.639	
<i>Annual farm income</i>						
No income	121	52	1			0.002
1–500	7	4	0.663	0.153	2.878	0.583
501–1000	16	13	0.611	0.251	1.487	0.278
> 1000	283	234	0.440	0.287	0.675	< 0.000
<i>Average monthly off-farm income</i>						
No income	325	242	1			.029
1–1000	15	16	1.165	0.518	2.623	0.712
> 1000	87	45	1.849	1.175	2.911	0.008
<i>Sufficient crop production over the year</i>						
No	382	245	1			0.002
Yes	45	58	0.453	0.274	0.748	
<i>Dietary diversity</i>						
Inadequate	322	166	1			0.002
Medium	103	133	0.548	0.382	0.786	0.001
Adequate	2	4	0.219	0.034	1.422	0.112

Those households that had an oxen are 54.6% less likely to be food insecure than those who don't have any [AOR 0.454 (95% CI 0.323–0.639,  $P < 0.001$ )].

## Discussion

In the current study, more than half of the households in Fedis Woreda were food insecure. The finding is less than the study conducted in Kersa Woreda of Oromia region [13] showing 70% food insecurity. The difference could be related to the study period. There is a 2-year difference between these studies where the study conducted in Kersa was in 2012, whereas the current study, i.e., Fedis, was conducted in 2014.

The amounts of annual income of the household obtained from own farm have played a significant role in determining the household food insecurity. Likewise, a study conducted in southern Ethiopia [8] also indicated that those farmers who have better access to different types of farm income are less likely to become food insecure than those households who have little income. Moreover, a study conducted in Dire Dawa also shows a study conducted in Dire Dawa [15] which shows that households that have access to better income opportunities are less likely to become food insecure than those households who had no or little access. Nevertheless before in this study, the presence of an off-farm income

in the household has an inverse relation with the household food security, meaning that households who earn better income are more food insecure. This could be explained by the idea of the income which may not have been used for purchase of food item; rather, it might have been used for other expenses like for purchasing alcohol drinks and khat.

Regarding to the crop production, those households who have sufficient production for the years were less likely to be food insecure than households that have experienced shortage of crop production. Considering own farm production being the major source of food, having sufficient production for the year will make the household to have sufficient food. Moreover, it will also support the household to use the income they might get from own farm for purchase of supplementary food items and improve their diet diversity. Another variable that has significance on the household food insecurity is dietary diversity. Those households who have consumed at least four or five types of food groups were less likely to be food insecure. It is also supported by the study conducted in ten countries [16] which reports that increasing the household dietary diversity will significantly improve the energy availability.

Education level of the household head is an important variable mostly assumed to have an impact on food insecurity status of the household. According to this study, households whose head has attended at least primary school were less likely to be food insecure compared with those who can't read and write. It also agrees with the findings of study conducted in Dire Dawa which also shows that the higher the educational level of household head, the more food secure the household is expected to be [17]. The result also coincides with the theoretical evidences that education equips individuals with the necessary knowledge of how to make a living. It is also believed that households who have at least primary education are the ones to be more likely to benefit from agricultural technologies and thus become food secure. However, another study conducted in Dire Dawa shows that the coefficient of education level of the household head was not statistically significant. This may imply that education of household head has not yet enhanced households' capabilities to adopt better production technologies and accept technical advice from extension workers and diversifying their source of income than the illiterate ones which would have reduced the risk of food insecurity among households [17].

Family size is another important variable, which has an influence on household food insecurity. Households who have larger family sizes were six times higher to be food insecure than households with fewer family sizes. The finding is supported in a study conducted in southern

Ethiopia [8] which also shows that as the family size increases, food insecurity increases. This could be due to the fact that as family size increases, the amount of food for consumption in one's household increases and, therefore, that additional household member shares the limited food resources. This study showed that households who had a land size between 0.5 and 1 ha were three times more food insecure than households that have less than half hectare.

The relationship between the ownership of oxen and food insecurity turned out to be negative and statistically significant. This is an indication that ownership of ox acts as a hedge against food insecurity in the study area. A study conducted in Oromia region [18] showed that ox ownership is found to have a significant and positive relationship with household food security.

The study focused on identifying factors that are expected to influence household food insecurity in the rural areas of Fedis Woreda. As the unit of analysis is a household, the study lacks macrolevel variables that affect household food security status such as market price and crop diversity. Moreover, qualitative methods were not used which could have enabled to find out additional relevant information. Lastly, there might be a recall bias in estimating the quantity of food consumed during the past week.

## Conclusions

In the study area, large proportion of the study participants were food insecure. In the current study, having larger number of family size, owning a large size farmland and earning a better income from off-farm income have increased the chance of being food insecure household. Meanwhile, better education of the household head, earning a better income from own farm, sufficient crop production over the year, dietary diversity and ox ownership have a negative influence on the state of household food insecurity.

Based on the findings and conclusion of the study, the following policy recommendations are forwarded. Policy measures directed toward the provision of better family planning to reduce household family size should be given adequate attention. High yielding improved crop varieties, and the use of modern inputs should be facilitated and strengthened. Government as well as humanitarian agencies such as NGOs and UN agencies should consider and strengthen income generating activities. The regional and federal governments should provide access to education for farmers both formal and informal like Farmers Field School should be strengthened. Government, NGOs and UN agencies should continue promoting the consumption of diversified food and also strengthen nutrition education. Finally, further studies

should be conducted on the area of food security considering detailed and accurate information on various variables including political, climatic and weather (rainfall and temperature), topography, natural disasters, ecological conditions and other factors that affect food security. Moreover, some variables which were found to be different compared with other studies like off-farm income and food aid should be further studied.

#### Abbreviations

AE: adult equivalent; DRMFS: Disaster Risk Management and Food Security Sector; EHNRI: Ethiopian Health and Nutrition Research Institute; FAO: Food and Agriculture Organization of the United Nations; FS: food secure; FIS: food insecure; GDP: gross domestic production; HFIS: household food insecurity; HH: household; IFPRI: International Food Policy Research Institute; Kcal: kilocalorie; SDPRP: Sustainable Development and Poverty Reduction Programme; SSA: Sub-Saharan Africa; SPSS: Statistical Product and Service Solution; PAS-DEP: Plan for the Accelerated and Sustained Development to End Poverty.

#### Authors' contributions

Conception and design of the work proposal, collection of data, analysis and interpretation of data were done by MM, GT and ZA. Drafting the manuscript article, revising it critically for intellectual content and final approval of the version to be published were done by MM, GT and ZA. Finally, before submission for publication, all authors read and approved the final manuscript.

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#### Competing interests

The authors declare that they have no competing interests.

#### Availability of data and materials

It is possible to access the data on personnel request from the principal investigator.

#### Consent for publication

Consent was taken from the child's parents as it would be disseminated to the concerned using different means.

#### Ethical consideration and consent to participate

The study was undertaken after the approval of the institutional research ethical review committee of University of Debre Markos and GAMBY College Health Sciences. Official letter was written from the college with the detailed explanation of the purpose and importance of the study to Oromia Bureau of Agriculture. The purpose of the study was explained to each study participant, and informed verbal consent was obtained from all study subjects before conducting the actual interview and discussions. For this purpose, a consent form was attached to each questionnaire which explained about the purpose and importance of the study, confidentiality and the respondent's full right to

answer the questions or not before the beginning or at any time of the study. Each interview was conducted after informed verbal consent was secured. All the collected data are kept in safe custody by the responsibility of the primary investigator.

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